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Subject: Aquifer Test and Capture Zone Analysis for Well RE137, RE108 Hot Spot
Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage

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1. INTRODUCTION

This Technical Memorandum (TM) prepared by Resolution Consultants (Resolution) presents the results of aquifer testing and capture zone investigation using newly installed well RE137 (RE137) that was installed in the RE108 Hot Spot associated with the Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York. The investigation was conducted to better characterize the local aquifer hydrogeology and to support the remedial design to address the RE108 Hot Spot plume area. The data collection activities were conducted from October 21, 2016, beginning with the installation and sampling of vertical profile boring (VPB) 171, and concluded following the installation, development, and aquifer testing completed at co-located RE137 on April 14, 2017.

2. SCOPE AND OBJECTIVES

The objectives of the field investigation were to further characterize the local aquifer and develop hydrogeological parameters needed to design a recovery well(s). It is anticipated that recovery well(s) will be used to hydraulically capture the RE108 Hot Spot groundwater contamination. Per the work plan (Resolution, 2016c), the following field tasks were completed to achieve the objectives of this study:

- VPB171 was drilled, sampled, and logged to 770 feet (ft) below ground surface (bgs)
- Recovery well RE137 was installed to a depth of 750 ft bgs, developed, and used to conduct:
    - A step-test to evaluate operation efficiency of the well
    - A constant rate pumping test to evaluate aquifer parameters
- A temporary groundwater treatment system was constructed, tested, and operated to treat all water recovered from RE137 prior to discharge:
    - Groundwater quality samples were analyzed to finalize treatment system design and demonstrate compliance with discharge permit requirements
    - Extracted groundwater was discharged to Nassau County Sump #305 located adjacent to RE137

The scope of this report focuses on the aquifer testing, local aquifer hydrogeology and development of aquifer hydraulic parameters, and analysis of the RE137 capture zone. The VPB171 data summary report and RE137 well installation report was previously submitted under separate cover.

2.1 Report Organization

The remaining sections of this TM present the following:

- Section 3 – A background description of the Magothy aquifer in which the RE108 Hot Spot area is located and information and characterization of the local aquifer hydrogeology and contaminant plume.
- Section 4 – Data collection methods used for monitoring surrounding water levels during the constant rate test and for conducting the aquifer tests; a summary of pump operation times and flow rates for each aquifer test; and site weather data that was collected and used to assess potential aquifer recharge from rainfall and aquifer response to barometric pressure changes.
- Section 5 – Trends in observed (i.e., recorded) water levels at 19 observation wells that were monitored before and during aquifer tests conducted at RE137; an assessment of the impacts of barometric changes with regard to water level fluctuations and the observed water level trends; and how water level changes that occurred in response to pumping tests

were interpreted and modeled to estimate the well efficiency of RE137 and the hydraulic properties of the local aquifer.

- Section 6 – Two lines of evidence based on Environmental Protection Agency's (EPA) guidance (2008), consisting of water level mapping and analytical equations used to evaluate the hydraulic influence of RE137 pumping and estimate the capture zone with respect to the local trichloroethene (TCE) plume.
- Section 7 – A summary of the samples collected to assess the effectiveness of the temporary groundwater treatment system used to remove contaminants in accordance with discharge permit requirements; and a summary of the groundwater sampling results for samples collected during the RE137 constant rate test that represent baseline conditions.
- Section 8 – Provides a summary and conclusions based on the data monitoring, analyses, and results presented in the above sections.

3. AQUIFER BACKGROUND

Overburden at the site consists of approximately 1,000 ft of sedimentary deposits overlying crystalline bedrock of the Hartland Formation. Overburden is divided into four geologic units: the upper Pleistocene deposits, the Magothy Formation, the clay member of the Raritan Formation ("Raritan Clay") and the Lloyd Sand member of the Raritan Formation ("Lloyd Sand) (Geraghty and Miller, 1994).

The upper Pleistocene ranges in thickness from approximately 50 to 100 ft and consists of till and outwash deposits of medium to coarse sand and gravel with lenses of fine sand, silt and clay (Smolensky and Feldman, 1995); these deposits form the Upper Glacial Aquifer. Directly underlying this unit is the Magothy Formation which ranges from 100 to 930 ft bgs measured in the vicinity of RE137. The Magothy is characterized by fine to medium sands and silts interbedded with zones of clays, silty sands and sandy clays. Sand and gravel lenses are found in some areas between depths of 600 and 875 ft bgs; these deposits form the Magothy Aquifer. The Raritan Clay is encountered at NWIRP at a depth of approximately 700 to 1,000 ft bgs. The Raritan Clay Unit is of continental origin and consists of clay, silty clay, clayey silt and fine silty, sand. This member acts as a confining layer over the Lloyd Sand Unit. The Lloyd Sand Member is also of continental origin, having been deposited in a large fresh water lacustrine environment. The material consists of fine to coarse-grained sands, gravel, and inter-bedded clay and silty sand. These deposits form the Lloyd Aquifer.

The Upper Glacial Aquifer and the Magothy Aquifer comprise the aquifers of interest at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their contact and the lack of any regionally confining clay unit allows for the unrestricted flow of groundwater between the formations.

The Magothy Aquifer is the major source of public water in Nassau County. The most productive water bearing zones are the discontinuous lenses of sand and gravel that occur within the siltier matrix. The major water-bearing zone(s) are anastomosing basal gravels located at or near the contact with the Raritan. The Magothy Aquifer is commonly regarded to function overall as an unconfined aquifer at shallow depths and a confined aquifer at deeper depths.

Groundwater is generally encountered at a depth of approximately 50 to 60 ft across the area encompassing the off property plume. Historically, because of pumping and recharge at the facility, groundwater depths have been measured to range from 40 to 60 ft bgs. The regional groundwater flow in the area is to the south-southeast.

In 2014, an area of elevated TCE (4,600 micrograms per liter [µg/L]) was detected at the RE108 location. This area is now referred to as the RE108 Hotspot, a nomenclature consistent with the Navy's 2003 Record of Decision that defines a hotspot as an area with greater than 1,000 parts per billion (ppb) of total volatiles in groundwater. Recovery well RE-137 was located in the southern portion of this hotspot to potentially facilitate groundwater remediation.

Figures A-1, A-2, and A-3 presented in Attachment A graphically present a geophysical/TCE-Tetrachloroethene (PCE) cross sections location map along with north-south and west-east cross sections that intersect VPB 171; these sections trend through the RE108 Hotspot. The intent of these figures is to illustrate the relative concentration of TCE in the stratigraphic section and to identify trends in the relative mass. Correlations have been drawn on the figures that indicate the general presence of shallow, intermediate, and deep plumes. Separations between and within these divisions are based primarily on the inflections in TCE concentration, although PCE was also considered. Specifically, the findings indicate the following:

West-East through the RE108 hotspot:
The shallow plume can be separated into two intervals. The top of the overall shallow plume ranges from 100 to 150 ft bgs, and the base ranges from 360 to 440 ft bgs. The intermediate plume can also be separated into two intervals, with the top ranging from 360 to 440 ft bgs, and the base from 600 to 720 ft bgs. The top of the deep plume ranges from 600 to 720 ft bgs, and the base ranges from 680 to 860 ft bgs. Overall, the intermediate zone hosts the most relative mass; the thickness of the shallow and intermediate zones are approximately equal and are much thicker than the deep zone. The thickness of the combined plumes is thicker and deeper in the central portion of the RE108 hotspot. As expected, for the most part, higher concentrations in all plumes tend to correlate with intervals with lower gamma counts (less clay content and higher permeability).

North-South through the RE108 hotspot:
The shallow plume is absent in VPB156, and a separation between the shallow plume is evident only in the central area of the RE108 hotspot. The top of the shallow plume ranges from 100-150 ft bgs, and the base ranges from 260 to 420 ft bgs. The intermediate plume can be separated into two intervals except at the southern extent of the cross section (VPB149); the top of the plume ranges from 260 to 605 ft bgs, and the base ranges from 570 to 720 ft bgs. The top of the deep plume ranges from 570 to 720 ft bgs, and the base ranges from 620 to 765 ft bgs. Overall, the intermediate plume hosts the majority of the mass. The intermediate plume is much thicker than the shallow and the deep plumes. The thickness of the combined plumes is thicker in the central portion of the RE108 hotspot; the intermediate and the deep plumes dip to the south. In general, higher concentrations tend to correlate with intervals with lower gamma counts (less clay content and higher permeability).

3.1 RE108 Hot Spot Plume

Recovery well RE137 was collocated and installed following the installation of VPB171. For reference, the geologist log for VPB171 and the geophysical/TCE-PCE profile log are presented in Attachment A as Figures A-4 and A-5.

The geologic profile for VPB171 consists of:

> 0-370 ft: A predominately sandy interval with minor silt and clay lenses, likely nearshore deltaic and possibly littoral origin representing transgression/regression sequences;
> 370-420 ft: A relatively thick clay unit, possibly of marine origin;

420-760 ft: A relatively thick sequence of sands, silts, and clays, likely of deltaic and possibly littoral origin representing regression/transgression and or lateral delta migration origin.

There are four notable clay units in this sequence at 485-492 ft, 552-560 ft, 610-625 ft, and 660-710 ft.

The TCE-PCE profile for VPB171 identifies five intervals that host the mass of these constituents: 150-275 ft (shallow plume), 275-420 ft (shallow plume), 460-540 ft (intermediate plume), 540-680 ft (intermediate plume) and 680-740 ft (deep plume). The highest concentrations were detected at 340 ft, 600 ft, 700 ft, and 740 ft. The calculated relative mass loads computed as the average concentration per foot for each interval are:

150-275 ft: 0.68 ppb/ft; (Shallow)
275-420 ft: 0.28 ppb/ft; (Shallow)
460-540 ft: 4.36 ppb/ft; (Intermediate)
540-680 ft: 7.64 ppb/ft (Intermediate)
680-740 ft: 62.54 ppb/ft. (Deep)

Lithologic correlations: Higher concentrations in the upper shallow plume are associated with a sandy interval and in the lower shallow plume with sandy intervals immediately below clay units, suggesting possible back diffusion from the clays. Higher concentrations in the intermediate plume tended to correlate with sandy intervals. Higher concentrations in the deep plume correlate with a clay sequence, again suggesting back diffusion.

3.2 Municipal Supply Well Impacts

As is noted in the following sections, supply well pumping by the Bethpage Water District (BWD) is known to influence water levels in the Magothy aquifer at most of the monitoring wells used for water level observations during the RE137 aquifer testing. The Navy previously assessed the impacts of BWD well 6-2 (BWD 6-2) on the hot spot plume area and the results were published in "*Bethpage Water District Well 6-2 Pilot Test Report*" (Resolution, 2016d). During this study, BWD was contracted to operate well 6-2 at constant pumping rates (nominally 1,153 gpm) for weekly periods with intervals of well shutdown while the water level responses at surrounding observation wells were monitored using data loggers, similar to the current study for well RE137. The data showed BWD 6-2 drawdown impacts of 1.0 to 1.5 feet in the intermediate/deep aquifer zone at the location of RE137 and even greater drawdown occurred at observation wells located to the east and north of RE137 (in the general direction of BWD 6-2). Aquifer parameters derived from the pumping periods showed an average Magothy aquifer horizontal hydraulic conductivity of 96 feet per day and a range of 78 to 120 feet per day for the shallow (480 to 575 ft bgs), intermediate (590 to 710 ft bgs), and deep (710 to 880 ft bgs) aquifer zones that were monitored. Analysis of the BWD 6-2 capture zone indicated nominal pumping at 1,153 gpm could capture 11, 15, and 53 percent of the 2016 TCE plume at depths of >500, >600, and >700 ft bgs, respectively.

4. DATA COLLECTION METHODOLOGY

Field data collected during testing and analysis conducted at RE137 included:

- Water levels recorded at logarithmic time intervals in RE137 during each of the three pumping steps (i.e., step test)
- Water levels recorded at logarithmic time intervals in RE137 during the constant rate test
- Water levels recorded at five-minute time intervals at 19 observation wells in the surrounding local aquifer during the constant rate test
- Pumping rates for each aquifer test interval
- Locally recorded weather data to assess impacts of potential aquifer recharge and barometric pressure changes on the pumping tests
- Groundwater samples of influent/effluent from the temporary groundwater treatment system

Figure 4-1 shows the location of VPB171/RE137 and the location of existing wells with data loggers that were used to record water level observations. Also shown on the figure are the locations of multiple supply and remedial extraction wells to the east and north of RE137: BWD supply wells 6-1, 6-2, 4-1, 4-2, and 5-1; GM-38 Hot Spot extraction wells RW-1 and RW-3; and On Site Containment System (ONCT) extraction Wells 1, 17, 18, and 19.

4.1 Water Level Data

The data set used in these analyses includes water levels recorded in late February, March, and most of April 2017 at monitoring wells used as observation wells surrounding RE137. Water levels were also recorded in RE137 during the step test conducted on April 10, 2017, and during the constant rate test that began on April 11, 2017 and concluded on April 14, 2017.

A total of 19 existing monitoring wells at 10 geographic locations were utilized to monitor water levels (i.e., observation wells) during the constant rate aquifer test conducted at RE137 (see Figure 4-1). Well clusters (i.e., two or three wells at one location, each screened at a different depth bgs) in the Magothy aquifer were monitored at most locations. The data logger in monitoring well RE104D2 malfunctioned and the manufacture was unable to recover the data for the time interval of interest. Table 4-1 provides construction and location details for the observation wells used during the constant rate test.

4.1.1 Analytical

Water levels were recorded in the observation wells using electronic data loggers placed a sufficient distance below the static water level in the well to allow for fluctuation of the water level above the logger during the monitoring period. The loggers were decontaminated prior to use and set up per manufacturer's specifications. The loggers were programmed to record the change in absolute total pressure at five-minute intervals. An additional data logger was used to record atmospheric barometric pressure at well location RE104D1. The data were downloaded from the loggers following the end of the constant rate aquifer test.

The data loggers placed in the observation wells contained non-vented pressure gauges that recorded absolute pressure (i.e., total of water and barometric pressure). The recorded barometric pressure data were subsequently used to adjust the recorded absolute pressure, using software provided by the data logger manufacturer, to produce a record of the water pressure in each well at each time recorded. The depth to water was also manually measured in each well at recorded times and referenced to the surveyed top of well casing elevation. These data allowed the recorded water pressure in each well to be converted into groundwater elevation data at five-minute intervals over the monitoring period. Tabular water elevation data recorded by the loggers is provided on a disc in this report.

A single electronic data logger was used to monitor water levels in RE137 during both the step and constant rate aquifer tests. A vented data logger was used to record gauge pressure of the water column (i.e., barometric pressure adjustment was not required). The logger was placed a sufficient distance below the static water level in the well to allow for fluctuation of the water level above the logger during the testing drawdown. The logger was decontaminated prior to use and set up per manufacturer's specifications. For aquifer testing, the logger in RE137 was programmed to record the change in water pressure at logarithmic time intervals; this logging setup produces closely spaced data intervals during the initial phase of pumping the well when drawdown is most rapid.

By comparing the screen depth intervals of the 18 observation wells (see Table 4-1) to the screen depth interval of RE137 and the known stratification of the Magothy aquifer, the observation wells were vertically grouped into three aquifer depth-zone intervals for this analysis:

- Shallow Zone – wells screened between 520 to 610 ft bgs,
- Intermediate Zone – wells screened between 625 to 710 ft bgs, and
- Deep Zone – wells screened between 710 to 760 ft bgs.

RE137 is screened from 630 to 745 ft bgs, and the bottom of the Magothy aquifer (i.e., top of Raritan clay) is approximately 880 ft bgs; therefore, the top of the Raritan was not reached in VPB171 or RE137.

Figure 4-2 provides a schematic of the pumping and observation well screen depth intervals in relation to the screen depth of RE137. Wells are depicted with respect to their distance from RE137, regardless of their azimuth from the well. Also shown are the screen intervals for specific BWD supply wells because pumping intervals at these wells are known to influence water levels at the observation wells in addition to pumping conducted at RE137 (see Section 5.1). As indicated in Figure 4-2 and Table 4-1, there are 5 observation wells in the shallow, 6 observation wells in the intermediate, and 7 observation wells in the deep aquifer zones. At some well locations two wells were grouped in the same depth interval (e.g., RE103D1 and D2). The grouping of the observation wells in each of the three depth zones is also supported by similarities in the observed change in water levels (i.e., drawdown, discussed in following sections) during the pumping of RE137; that is, the wells in a given group appeared to experience a similar magnitude of drawdown due to pumping, with consideration given to their distance from RE137.

Also included on Figure 4-2 is the VPB171 gamma log that indicates the vertical profile of geologic facies represented by layered sediments, the approximate depth of the Raritan clay (i.e., bottom of Magothy aquifer), and noted intervals of persistent marine clay horizons, some of which have been mapped across the area using environmental sequence stratigraphy (see Environmental Sequence Stratigraphy (ESS) Report provided in Resolution, 2016d). Because the gamma log for VPB171 ended at 740 ft bgs, the gamma log from nearby VPB154 was used on Figure 4-2 to extend the gamma profile down to the Raritan clay. The ESS features are based on depositional interpretation of lithologic and gamma logs for the numerous VPBs that have been installed by Resolution during various phases of NWIRP investigation (Resolution, 2013 through 2016) in conjunction with published reports describing the Magothy aquifer.

4.2 Pumping Data

The RE137 tests were conducted during two periods:

- Step test on April 10, 2017
- Constant rate test between April 11 and 14, 2017

The step test consisted of three sequential pumping intervals at rates of 100, 200, and 300 gallons per minute (gpm) with each pumping rate interval lasting approximately 120 minutes when a relatively stable water level in RE137 was reached. Breaks of 25 to 30 minutes were implemented between each pumping interval during which the water level was allowed to recover to the approximate static water level before the next pumping interval began.

The constant rate test consisted of one pumping interval at an average rate of 741 gpm that ran for approximately 3 days, or 4,338 minutes. Figure B-1 is a plot of the instantaneous pumping data during the test along with an Excel®-generated linear trend line (see Attachment B). The instantaneous flow meter readings of the pump discharge showed fluctuating flow rates during the initial hours of the test period that became steadier as the test progressed.

Before and during the RE137 test pumping cycles, local supply wells at BWD Water Plants 5 and 6 were operated by BWD as needed to meet the public water supply demand or for periodic sampling. Pumping operation information for some BWD supply wells in the area recorded by BWD personnel were provided to Resolution. Table B-1 in Attachment B provides a summary of the pumping information provided by BWD.

Several additional groundwater extraction wells were in use during the RE137 testing cycles.

- Three ONCT remediation wells (Wells 17, 18, and 19; [see Figure 4-1]) south of the facility, north of RE137, were operated by Northrop Grumman Corporation.
- Two GM-38 Hot Spot remediation wells, RW-1 and RW-3, northeast of RE137 were operated by Koman (Navy contractor).

During the BWD 6-2 Pilot Test study (Resolution, 2016d), operational data for the ONCT wells indicated that, with the exception of short pumping interruptions, these wells were typically operated continuously at a near constant rate. Similarly, operational data for the GM-38 Hot Spot wells obtained for the pilot test study showed that these wells were likewise operated continuously at a near constant rate. Based on this information, it was assumed that a near steady-state equilibrium had been achieved in the aquifer in the vicinity of these recovery wells during their operation. It was concluded that constant pumping at these wells likely had little impact on water levels observed in the observation wells during the pumping tests conducted at RE137, with the exception of intermittent pump shutdowns or temporary reductions in extraction rates.

4.3 Site Weather Data

Barometric pressure and rainfall were the two weather factors of interest during the RE137 testing cycles. Barometric pressure was monitored at well RE104D1 (see Figure 4-1) using a Barologger Edge manufactured by Solinst, Inc., that was programed to record atmospheric pressure at five-minute intervals. Barometric pressure data was used to convert absolute pressure readings recorded by the non-vented data loggers in observation wells to changes in water levels. The data was also independently used to assess aquifer barometric efficiency, discussed further in section 5.1.2. Daily rainfall data was obtained for the entire testing period from the weather recording station located in Farmingdale, NY (Station ID USW00054787). No rainfall was recorded during the RE137 testing periods, although several inches of rainfall were recorded during the week prior to RE137 testing.

4.4 Groundwater Samples

Groundwater samples were collected using a Hydropunch™ during installation of VPB171 and laboratory analyses were conducted for volatile organic compounds (VOCs) using EPA Method 8260C. The depth-profile sample results for TCE and PCE are presented in Figure A-5 on the geophysical profile for natural gamma (see Attachment A). The laboratory reports and sampling details for these VPB171 samples were submitted to the Navy under separate cover, but are summarized in Attachment A as background information for RE137.

Groundwater samples were collected to monitor performance of the temporary groundwater treatment system used during the installation and testing performed at RE137. Monitoring and analyses of the samples were conducted in accordance with the permit issued by Nassau County and the State Pollutant Discharge Elimination System (SPDES) equivalent permit issued by New York State Department of Environmental Conservation (NYSDEC) that allowed the treated water to be discharged to Sump #305 located adjacent to RE137. A baseline sample and samples of both the raw groundwater extracted from the Magothy aquifer during pumping at RE137 (i.e., influent to the treatment system) and samples of the treated groundwater (i.e., effluent from the treatment system) were collected. The baseline sample was collected on March 28, 2017, 8 days after well development; samples were then collected during the constant rate test at approximate six-hour intervals between the start of the test at 8:07 am on April 11, 2017, and the end of the test at 8.25 am on April 14, 2017. All samples were analyzed for VOCs using EPA Method 8260C as well as semivolatile organic compounds (SVOCs) using Method 8270C; total dissolved solids using Method 2540c; total suspended solids using Method 2540D; ammonia using Method 350.1; total nitrogen using method 351.2; pH using Method SM450HB-pH; E150, total, dissolved metals using Method 6010C; mercury using Method 7470 A and biochemical oxygen demand using Method SM5210B.

5. AQUIFER CHARACTERIZATION

An objective of the aquifer testing conducted at RE137 was to characterize the hydraulic influence of pumping on the local aquifer. The water level monitoring data that was collected allows for two methods of analysis, one based on direct observation of the hydraulic impacts of a known pumping rate and duration on the local aquifer (i.e., observed water levels), and another based on quantifying the aquifer parameters of transmissivity (T) and storativity (S) using aquifer test analysis, from which the hydraulic impacts can be predicted (i.e., modeled) for any pumping rate or duration. Discussion of the observed water level trends in response to pumping and calculation of aquifer parameters are presented in this section.

The methods of analysis utilize plots of water levels versus time or drawdown due to pumping versus time. All of these plots use a consistent color for each well location (e.g., cluster wells RE103D1, D2, and D3 are always dark green), a consistent line type for aquifer depth zone (i.e., shallow wells are dotted, intermediate wells are dashed, and deep wells are solid), and the sequence of wells in each plot legend begins with the well closest to RE137 (or BWD 6-2 for background trends) and ends with the well furthest from RE137 (or BWD 6-2) regardless of azimuth. In addition, each group of plots uses a consistent elevation or depth range for the vertical axis so that water level trends for each group are comparable. Tabular data that was used to construct the plots are provided on a disc in this report.

5.1 Observed Water Levels

Water level elevation trends for the observation wells (see Table 4-1) prior to, during, and following the step and constant rate pumping tests conducted at RE137 are presented on hydrographs provided in Attachment C. Figures C-1 through C-8 show the background water level trends at each monitoring well or well cluster location from late February through late April, 2017. Each hydrograph shows a variety of intermittent, low (0.5 ft or less) to high (several ft) magnitude water level fluctuations. These fluctuations are attributed to numerous municipal supply wells extracting groundwater from the Magothy aquifer that are operated on various schedules; the magnitude of the water level fluctuation is related to both the supply well pumping rate and the distance from the observation well to the pumping well.

It is noted that many of the hydrographs demonstrate an abrupt high magnitude decrease in water levels that began on March 10 and continues until April 17, 2017, when water levels abruptly recovered. Pumping information indicates that BWD 6-2 located at Plant #6 was put into continuous operation at an average rate of 1,150 gpm during this same time period; this well is screened from 700 to 770 ft bgs. The BWD Pilot Test study showed that BWD 6-2 had a similar impact on water levels at these same monitoring wells during the pilot study conducted in 2016 (Resolution, 2016d). Table C-1 in Attachment C lists the monitoring wells for each aquifer depth zone in order of increasing distance from BWD 6-2 and the drawdown observed on March 10, 2017. As expected, these data show an inverse relationship between distance from BWD 6-2 and drawdown, confirming the impact of BWD 6-2 pumping on the local aquifer surrounding RE137. It is also noted that drawdown in response to BWD 6-2 at a given location (e.g., RE103D1, D2, and D3) was greater for the deep aquifer zone and decreased upward for the intermediate and shallow aquifer zone wells. Data loggers had not been installed in wells RE137, RE121D2, TT101D1, and TT101D2 during March of 2017.

Another trend that is observed in Figures C-1 through C-8 is the overall rise in all water levels from February through April. This is attributed to an increase in aquifer recharge that typically occurs when temperatures rise from late winter to early spring and when rainfall increases. In addition, irrigation water use and evapotranspiration are generally low during this time of year. Rainfall that occurred from February through April 2017 is presented in Figure 5-1; these data show a total of 8.15-inches of rainfall during this time. An upward trend of water levels is also observed during the

BWD 6-2 pumping interval that depressed water levels, with the exception of a few days in mid-April (April 11 through 14) when the constant rate test was conducted at RE137.

5.1.1 RE137 Testing Water Level Trends

Water levels at all 18 monitoring wells recorded during aquifer testing intervals are presented in Figure C-9 for the period of April 7 (3 days before testing began) through April 14, 2017 (end of constant rate test). Two hydrograph plots were prepared, one for wells closer to RE137 (i.e., Near Wells 650 to 1,700 ft away) and one for wells more distant from RE137 (i.e., Far Wells 2,400 to 4,500 ft away). It is noted that Far Well MW117-5 is shown on the Near Well plot because its depressed water elevation (due to its proximity to BWD 6-2) fits only on the Near Well plot elevation scale. Wells RE114 are not presented on the plots due to their very far downgradient distance from RE137. Also, data loggers were placed in wells RE121D2, TT101D1, and TT101D2 just before the constant rate test started on April 11, 2017.

The starting points for the step and constant rate tests are identified on Figure C-9, and pumping intervals for BWD 5-1 and BWD 6-1 that are associated with intermittent water level changes are shown schematically on the figure. It is noted that BWD 6-2 was running continuously during the time interval shown on the hydrographs and its pumping is not schematically shown. As is typical for many aquifer settings, water level changes during the step and constant rate pumping tests at RE137 are greater for Near Wells versus Far Wells because aquifer drawdown and distance from a pumping well are inversely related. Because BWD 6-2 was pumping consistently throughout the RE137 testing period, this background stress created a temporary equilibrium in the surrounding water levels upon which the impacts of pumping at RE137 are overlain.

As can be seen in Figure 4-1, most observation wells are located north, hydraulically up gradient, of RE137; only RE121D2, TT101D1, and TT101D2 are located down gradient with respect to RE137. Due to the south-southeast flow direction in the Magothy aquifer (Resolution, 2016d) water level elevations in the observation wells would be expected to decrease from north to south. The water levels shown on Figure C-9 for Far Wells are generally consistent with this expectation, with the exception of water levels in deep well RE122D3 being lower than expected. Water levels shown for the Near Wells are not consistent with the expected gradient. For example, the water level elevation for RE105D2 is lower than down gradient wells TT101D1, D2 just prior to the start of the constant rate test and becomes lower than RE121D2 during the test. The inconsistent water level elevations observed for RE105D2, MW117-5, and all of the RE120 wells are due to the impact of BWD 6-2 pumping, that is, the cone of depression for BWD 6-2 had created lower-than-expected water levels and an associated change in the groundwater flow direction when the testing began at RE137.

Operating periods for BWD 5-1 and BWD 6-1 coincide with low magnitude fluctuations both before and during the RE137 testing periods in both the Near and Far Wells (see Figure C-9). The impacts from these supply wells appear to be somewhat greater for the Near Wells, but this is because most of the Near Wells are closer to BWD 5-1 and 6-1 (see Figure 4-1). It is noted that both these supply wells were operated at the start of both the step and constant rate testing, albeit for short intervals. In addition, it is observed that low magnitude, upward deflections in water levels are observed on several occasions immediately before wells BWD 5-1 and 6-1 began pumping. The reason for these intermittent upward fluctuations are not known, but they may be associated with short interruptions or variations for BWD 6-2 (not confirmed) or a more distant supply or extraction well that stopped pumping.

Water levels on Figure C-9 demonstrate a generally subdued response for the step test that began at 8:29 am on April 10, 2017, in both the Near and Far Wells compared to a larger response for the constant rate test. Well cluster RE120, being relatively close to RE137, shows a distinct response to the step test cycles. At more distant wells, the subdued response is related to the greater distance from RE137 and the relatively low pumping rate cycles of 100, 200, and 300 gpm implemented during the step test. These observations are the result of response lag, an increasingly delayed response of the aquifer at greater distances from the applied pumping stress at RE137.

Water levels demonstrate a more pronounced and immediate response to the constant rate test that began at 8:07 am on April 11, 2017 compared to the step test. This test was conducted at an average pumping rate of 741 gpm. As above, the more subdued response in the Far Wells is related to the distance of these observation wells from RE137. BWD 5-1 and BWD 6-1 pump for short intervals at the initiation of the constant rate test and likely exaggerate the initial water level decline; this is supported by the rebound in water levels that occurs shortly after the BWD wells stop pumping on April 11, 2017. Water levels are seen to generally rise for the remainder of the constant rate test until approximately mid-day on April 12, 2017, thereafter showing a steady to slightly lowering trend for the rest of the constant rate test period that ended at 8:25 am on April

14, 2017. These subtle changes in water level trends are attributed to a fluctuating pumping rate for RE137 that became steadier after mid-day on April 12, 2017 (Figure B-1). Water levels are observed to rebound at all observation well locations at the end of the constant rate pumping test at RE137. Although BWD 5-1 pumped briefly as the constant rate test ended, the more gentle slope of the rebounding water levels compared to the steeper initial drawdown slope likely reflects how the initial drawdown would have appeared had BWD 5-1 and 6-1 not been pumping at the start of the constant rate test.

5.1.2 Barometric Efficiency Assessment

To assess the potential impacts of atmospheric pressure changes on the monitored water levels, barometric pressure changes were compared to observation water level changes for several days to assess the aquifer barometric efficiency. April 7 through April 10, 2017 was selected for the comparison because during this interval a significant barometric pressure increase was recorded but pumping had not begun at RE137. This interval also represents a time when relatively few water level fluctuations were associated with supply wells turning off and on (see Figure C-9). This analysis strategy assumes that pumping has resulted in dynamic steady-state conditions during which changes in water levels may be attributed to only barometric pressure changes. Figure C-10 in Attachment C provides plots of the Near and Far Wells and the barometric pressure trend (units in ft of water) is presented on each plots secondary axis (right side of plot). Between April 7 and the morning of April 10, 2017 (when the step test began), there is a rise in barometric pressure equivalent to about 1 foot of water pressure; however, there is no apparent associated impact on the water level trend for any of the observation wells (a rise in barometric pressure would be expected to result in a decrease in water levels). The absence of an associated water level response suggests that the barometric efficiency of the aquifer is negligible, a finding that is consistent with the BWD pilot study (Resolution, 2016d). For this reason, barometric corrections to the observed water levels were not included for the data analyses.

5.1.3 Observed Water Levels Summary

Inspection of water level at monitoring wells during RE137 pumping cycles suggest the following hydraulic responses of the local aquifer, as follows:

- Pumping at BWD 6-2 at its nominal operation rate (i.e., 1,150 gpm) was conducted continuously during the RE137 testing cycles (both step and constant rate tests). This pumping created a widespread impact on aquifer water levels that were observed before and during the RE137 testing.

- Changes in water level elevations at the observation wells due to BWD 6-2 pumping ranged from 5.7 ft at the closest well (884 ft) to 0.8 ft at the most distant well (5,058 ft).
- Because of BWD 6-2 pumping, water levels at the start of both the step and constant rate tests conducted at RE137 reflected the stressed potentiometric surface; water level impacts from pumping conducted at RE137 were thus cumulative with the initial pre-stressed water levels.
- Pumping at BWD 5-1 and 6-1 also occurred during the RE137 testing period; short-term pumping at these wells created distinct short-term changes in observation well water levels.
- Water level impacts from pumping at RE137 during the step and constant rate tests were clearly observed in all observation wells. Lower pumping rates used during the step test (maximum of 300 gpm) resulted in less change in water levels compared to the constant rate test that was conducted at 741 gpm. The widespread response of observation well water levels to RE137 (and BWD 6-2) pumping indicates good hydraulic connectivity of the lower Magothy aquifer at depths of 500 to 800 ft bgs in which the observation wells are screened (see Figure 4-2).
- The barometric efficiency of the aquifer is considered negligible because atmospheric pressure changes had negligible impacts on water levels in observation wells screened in the lower Magothy aquifer.

5.2 Aquifer Pumping Test Analyses

The water levels recorded in RE137 during the step test and in the observation wells during the constant rate tests were analyzed to estimate the pumping efficiency of well RE137 and the hydraulic characteristics, transmissivity and storativity, of the Magothy aquifer. As described in the previous sections, both the step and constant rate tests at RE137 were conducted during continuous background pumping at BWD 6-2 that impacted water levels at all of the observation wells. In addition, water level trends in most observation wells also reflected brief intervals of influence from other BWD pumping wells (e.g., BWD 5-1, 6-1). Therefore, pumping at the BWD supply wells was included in the analyses.

The step and constant rate water level data were converted into drawdown (i.e., the incremental change in water level with respect to the initial water level at the time pumping began) and plotted versus the time after pumping began in minutes for each test. As was presented in the above sections for the water level trends, drawdown hydrograph plots are provided in Attachment D for the step test (Figure D-1) and the constant rate test (Figures D-2 and D-3). The pumping time intervals for each test were as follows:

- Step Test – April 10, 2017, three steps between 8:29 am and 3:29 pm
- Constant Rate Test – began April 11, 2017 at 08:07 am and ended April 14, 2017 at 8:25 am; recovery monitored until 12:35 pm

The aquifer pumping test analysis was conducted using the commercially available AQTESOLV for Windows computer program (Version 4.50 Professional from HydroSOLVE) that is formulated to analyze field data from well and aquifer tests. The program's automated type-curve matching feature that uses a nonlinear least squares procedure and visual best-fit curve matching were used to find a best-fit match with the observation well data. The observation well data were analyzed for time versus drawdown using the Hantush-Jacob (1955)/Hantush (1964) model for leaky confined aquifers without aquitard storage. A description and list of assumptions for use of the Hantush-Jacob leaky aquifer model is provided in Attachment D. This model is consistent with the semi-confined properties of the Magothy aquifer at depth and was used successfully for a prior aquifer pumping test analysis conducted at BWD 6-2 (Tetra Tech, 2013; Resolution, 2016d). This model allowed for partial penetration of the aquifer by both the pumping and observation wells, which were considered a required feature for the analysis due to the broad spectrum of observation well screen intervals in the aquifer. Furthermore, as can be seen on the drawdown plots provided in Figure D-3, all wells reached a near steady-state drawdown within relatively short pumping times, a response that is consistent with leaky aquifer conditions. The use of variably spaced, multi-depth observation wells located in various directions from RE137 was deemed reasonable to deduce the bulk aquifer properties in the area of RE137.

Setup of the AQTESOLV model required physical dimensions of the target aquifer that relied upon data collected by the Navy during field investigations to install RE137 and the observation wells. The associated drilling and gamma logs have documented that the Magothy aquifer extends to depths of 700 to 1,000 ft bgs where the Raritan clay marks the bottom of the aquifer. Glacial sediments from the ground surface to a depth of about 100 ft in the area of RE137 are identified as the Upper Glacial aquifer; this aquifer is in direct contact with and hydraulically connected to the underlying Magothy aquifer. The depth to water was recorded in the range of 40 to 50 ft bgs in the observation wells during the RE137 testing. The saturated sedimentary intervals of the Magothy aquifer represent a range of physical and hydraulic properties, but a laterally persistent aquitard layer has not been identified. The thick aquifer is conceptualized to host a multi-layered, heterogeneous sequence of stratified permeable layers that are in direct hydraulic communication. As noted in Section 3, the presence of numerous thin intervals of silts and clays in the Magothy formation results in semi-confined aquifer conditions at depth where a greater percentage of sand and gravel occurs and where RE137 and the observations wells are screened.

The leaky confined aquifer model was applied in AQTESOLV for each aquifer depth zone as previously identified in Section 4.1. This allowed for inspection of the properties of each aquifer depth zone in response to the pumping of RE137. For the constant rate test, all data from the start of pumping to 4,200 minutes after pumping began was used; recovery data was not used due to intervals of known but undocumented supply well pumping that occurred just before and during recovery. The model output for the step test and for each aquifer depth zone during the constant rate test are provided in Attachment D (Step Test, Figure D-4; Constant Rate Test, Figures D-5 through D-7).

Table 5-1 summaries the step and constant rate model results for transmissivity and storativity for each aquifer zone and provides comments regarding the analyses. The step test results indicate that RE137 has an efficiency of 94 percent, a low well skin (linear) loss factor, and negligible turbulent well loss. Low well skin loss indicates that the well has a good hydraulic connection with the aquifer and that head loss in the well (i.e., well inefficiency) related to the filter pack, residual drilling mud, biological or mineral encrustation, and/or borehole wall damage is minimal. Negligible turbulent flow indicates that laminar flow from the formation to the well prevails and that head loss due to turbulence possibly related to poor screen slot selection or damage, poor filter pack selection or placement, and potential formation damage are also of no significance. Data from the final step of pumping were used to calculate a specific capacity of 38.6 gpm per foot of drawdown. The constant rate test analysis used observed water level data from widely spaced screen depths for each aquifer zone, and relied partially upon best-fit type curve matching. Because of these factors, the results are deemed representative of bulk aquifer properties. Table 5-1 also provides the model generated values for the leakage factor (1/B) and the ratio of vertical to radial hydraulic conductivity (Kz/Kr) that reflects the relative ease with which water can move through the aquifer vertically versus horizontally. The bottom row of Table 5-1 provides average parameter values that represent an 'aquifer composite' by using thickness-weighted results for each zone. The step test aquifer parameter results provided in the table show a higher transmissivity, and thus conductivity (K), for the aquifer compared to the constant rate test. Because the step test was conducted for shorter intervals using lower pumping rates, the results are deemed less representative of the bulk aquifer properties than the constant rate test results.

Figure D-3 provided in Attachment D shows that while drawdown reached a near maximum value in the observation wells about 300 minutes after constant rate pumping began at RE137, the magnitude of drawdown was variable over the course of the 3-day pumping test for wells in each aquifer depth zone. This variation is attributed to several factors: fluctuations in the RE137 pumping rate (see Figure B-1); known supply well pumping intervals (i.e., BWD 5-1 and 6-1, as indicated on the plot); and unverified changes in pumping at other supply and/or remediation wells (e.g., ONCT and GM38 remediation wells). Also, as noted in Section 5-1, BWD 6-2 was pumping continuously at a rate of 1,150 gpm during both the step and constant rate tests. After about 300 minutes of pumping RE137, drawdowns are seen to partially recover until BWD 5-1 and 6-1 began pumping between about 1,300 and 1,650 minutes. The reason for the recovery is not explicitly known, but it is partially attributed to the unsteady RE137 pumping rate (Figure B-1). The unsteady pumping rate may be related to variation in engine speed of the electric power generator that provided power to the electric submersible pump, possible pump wear, and/or full capacity pumping and lack of back pressure in the discharge line (i.e., discharge restriction valve fully open) to achieve the target rate goal of nominal 700 gpm. The more abrupt recovery of water levels that occurs about 1,500 minutes after pumping of RE137 began is likely due to an unverified change or interruption of pumping at a supply well (e.g., BWD 6-2). This conclusion is supported by drawdown recovery above 0 ft on the plots in some shallow and intermediate wells that represent groundwater elevations above those at the start of pumping. Following about 1,700 minutes, water level trends appear to again reflect drawdown attributed to the pumping at RE137. At about 2,800 minutes a period of increased drawdown was observed that is coincident with pumping cycles for BWD 5-1 and 6-1. And, after about 3,500 minutes a relatively steady drawdown is achieved that likely represents steady pumping in all wells. A period of drawdown then occurs when BWD 5-1 pumping begins a few hours before RE137 pumping ends at 4,340 minutes.

6. CAPTURE ZONE ANALYSIS

An objective of the pilot test was to evaluate the hydraulic impact created by RE137 pumping and its potential to capture the RE108 Hot Spot TCE plume in the local aquifer. To address this objective, analyses were conducted to estimate the dimensions, shape, and projection of the groundwater capture zone that can be created by RE137 pumping at a nominal rate of 741 gpm. The water level monitoring and aquifer parameter data that was presented in Section 5 supported evaluation along two lines of evidence consistent with EPA guidance (2008) for capture zone analysis: 1) water level mapping and 2) analytical calculations of capture zone dimensions.

Water levels recorded during the constant rate pumping test were combined with aquifer drawdown modeling and used to map the pumping potentiometric surface and to visualize the areal extent of drawdown and changes in flow gradients resulting from RE137 pumping. The resulting maps provided information that supported placement of the flow stagnation point down-gradient of the pumping well. However interpretation of a dividing flow line around RE137 and estimation of an observed capture zone was greatly impacted by the cone of depression around BWD 6-2 that pumped throughout the duration of the constant rate test.

The analytical line of evidence for assessing the capture zone created by RE137 pumping used equations in EPA guidance (2008) to calculate the dimensions of the capture zone. The equations use the aquifer transmissivity, the background horizontal flow gradient, and the pumping rate to estimate the dimensions of the capture zone.

While neither line of evidence was found to be independently definitive, the combined results of the two approaches are believed to depict a reasonable estimation of the capture zone affected by RE137 pumping for the aquifer depth zones represented by the observation wells. The capture zones resulting from both lines of evidence (observed and analytical) are presented as overlays on TCE plume maps drawn using groundwater samples collected through early 2017. Overlaying the capture zones on the TCE plumes allows for an estimation of the plume areas that are likely to be captured by pumping at RE137.

6.1 Water Level Maps

As presented in previous sections, water levels were monitored at 10 geographic locations and at multiple aquifer depth zones and were interpreted using data from 18 observation wells during the RE137 constant rate test. During the constant rate test, water levels recorded at wells screened in the shallow, intermediate, and deep aquifer zones reflect the real-time hydraulic influence of RE137 pumping across the aquifer on each depth interval. However, because of the impact from continuous pumping conducted at BWD 6-2 during the RE137 constant rate test, background potentiometric surface maps were prepared for March 10, 2017, at 5:10 am before continuous pumping began at BWD 6-2. The water levels at this time reflect background conditions surrounding RE137 in the absence of BWD 6-2 pumping. Water level maps were also prepared for April 11, 2017, immediately before RE137 pumping began (i.e., t = 0 mins) and for a time representative of RE137 impacts on the local aquifer during the constant rate test (t = 480 mins). The logged water levels used to generate the maps are summarized in Table 6-1. The process to prepare the potentiometric surface maps consisted of the following:

- The recorded water levels for RE137 and observation wells in each aquifer depth zone were plotted on separate maps for each time interval.
- Linear interpretation based on the elevation change and distance between wells was used to locate contours between each set of observation well data.
- Because many of the observation wells are aligned nearly parallel to the established groundwater flow direction (north-northwest to south-southeast) and therefore do not necessarily support extending contours perpendicular to the flow direction, a groundwater flow direction reference line was included on each figure that represents the background flow direction observed during the BWD Pilot Study conducted by the Navy in 2016 (Resolution, 2016d). This flow direction reference line was used to support drawing the potentiometric contours through the interpolated contour intervals based on the data points (i.e., observations wells).
- Because RE137 is screened across the intermediate and deep aquifer depth zones used in this report, the observed water levels for RE137 are representative of only the intermediate and deep zones. The water level at RE137 for the shallow zone (expected to be higher) was estimated by taking the average difference between nearby shallow and deep observation well water levels and subtracting that value from the observed water levels at RE137 to represent the shallow zone.
- Because aquifer water levels were not monitored at BWD 6-2, water levels for this location were interpolated from pumping conducted at a similar rate (previous 1,153 gpm vs current average of 1,150 gpm) as documented in the BWD Pilot Study report (Resolution, 2016d).
- Interpretation of the potentiometric surface maps also relied on professional judgement, familiarity with the local hydrogeology, and knowledge of site conditions and prior potentiometric maps of the area.

Figures 6-1 through 6-3 present the background potentiometric surface maps for each aquifer depth zone before BWD 6-2 began continuous pumping on March 11, 2017. The potentiometric surface contours show a north-northwest by south-southeast groundwater flow direction that reflects the area-wide potentiometric surface that has been previously mapped (Resolution, 2016d). Each aquifer depth zone shows a similar pattern and a generally consistent contour spacing that reflects the non-pumping status of BWD 6-2 and RE137. The deep aquifer zone indicates a deviation in the pattern to the north that results from a lower than expected water level at well MW117-5. This deviation may be the result of a change in pumping for the nearby GM-38 Hot Spot extraction wells or at some other supply/extraction well located to the north and east of MW117-5.

Figures 6-4 through 6-6 present the potentiometric surface for each aquifer depth zone at t = 0 mins (i.e., immediately before RE137 pumping began) and were constructed using interpolation methods described above for background conditions. An estimated pumping water level of 20 ft above mean sea level (amsl) was used at BWD 6-2 based on previous investigation of this well (Resolution, 2016d). Because the density and distribution of observation wells surrounding BWD 6-2 was insufficient to accurately map the cone of depression, the contours in proximity to this well relied on professional judgement and are estimated. These three figures demonstrate the areal impact of continuous pumping at BWD 6-2 on observation wells surrounding RE137, particularly those located to the east and north of RE137. Comparison of Figures 6-1 through 6-3 with Figures 6-4 through 6-6 shows a 1 to 2 foot lowering of the potentiometric surface and eastward deflection of groundwater flow caused by the continuous pumping and cone of depression at BWD 6-2.

Figures 6-7 through 6-9 present the potentiometric surface for each aquifer depth zone at t = 480 mins (i.e., 8 hours after RE137 pumping began) and were constructed using interpolation methods described above for background conditions and for t=0 minutes. As above, water levels were not monitored in the aquifer at BWD 6-2, but an estimated pumping water level of 20 ft amsl was used based on previous investigation of this well (Resolution, 2016d). Also, the density and distribution of observation well data did not provide sufficient data points to map the pumping potentiometric contours representing the cone of depression around RE137 (i.e., horizontal gradient well pairs were not available, as described in EPA guidance). To support mapping of the potentiometric surface during RE137 pumping, the leaky-aquifer model and local aquifer parameters presented in Table 5-1 were used in AQTESOLV to model distance versus drawdown along a flow line through RE137 at t = 480 mins for each aquifer depth zone. This information was then used to produce distance-drawdown plots during pumping at RE137 and to create supporting data points for mapping the potentiometric surface. As shown in Table 6-1, the observed drawdown in the intermediate and deep aquifer zones at RE137 at t = 480 minutes during the constant rate test was 16.7 ft. Due to partial penetration effects, drawdown in the shallow aquifer zone at RE137 was expected to be less than what was observed for the intermediate/deep aquifer zones. For mapping purposes, drawdown in the shallow zone was estimated based on distance versus drawdown modeling to be 15.5 ft (see below).

The AQTESOLV-generated, distance-drawdown plots for each aquifer zone at t = 480 minutes are provided in Attachment D (Figures D-8 through D-10). Drawdown was graphically extrapolated from these plots for observation points located at selected distances (up- and downgradient) from RE137; these data are presented for each aquifer depth zone in the upper portion of Tables 6-2 through 6-4. Figures 6-4 through 6-6 were used to estimate the average background gradient for t = 0 minutes that is listed in the notes for Tables 6-2 through 6-4. Using the observed water level at RE137 and the gradients, background water levels for t = 0 minutes were calculated for each observation point and are presented directly above the modeled drawdown on each table. The pumping water levels presented for t = 480 mins were calculated by subtracting the drawdown from the background water level for t = 0 minutes for each observation point.

Tables 6-2 through 6-4 include a graphic plot of the background and pumping water levels that represents the water levels along a groundwater flowline through the RE137 location. The downgradient stagnation point along this flowline, as highlighted in the upper portion of each table and as visible on the plot of pumping water levels, occurs at the peak elevation of the downgradient pumping water levels. For the shallow aquifer zone, the stagnation point was estimated at an elevation of 43.87 ft and was located 650 ft downgradient of RE137; for the intermediate aquifer zone, the stagnation point was estimated at an elevation of 41.06 ft and is located 1,200 ft downgradient of RE137; and for the deep aquifer zone, the stagnation point was estimated at an elevation of 41.79 ft and is located 1,200 ft downgradient of RE137. The distance-drawdown modeling was conducting using aquifer properties derived using a best-fit type curve analysis for each aquifer depth zone analysis, and the leaky aquifer model assumes homogeneous aquifer conditions. As a result of these conditions, the distance-drawdown results are considered approximations and may vary from observed conditions, particularly as the observation point distance from RE137 increases. However, the mapped potentiometric surfaces generated using the combination of the model predictions and drawdowns at the observation wells are compatible and were judged to provide reasonable results.

At the bottom of Tables 6-2 through 6-4 a listing of distances versus pumping water levels is provided that were used to support interpretation of the t = 480 minutes potentiometric surfaces for each aquifer depth zone in Figures 6-7 through 6-9. The calculated pumping water levels were plotted on a flowline drawn through RE137 and used in conjunction with the observation water levels at t = 480 minutes to manually interpret the potentiometric surface contours shown on Figures 6-7 through 6-9. The logged water level is posted for each observation well along with the pumping water level for RE137. The pumping water levels calculated and listed at the bottom on Tables 6-2 through 6-4 are not shown on these figures, but were used to identify the stagnation point and for interpreting and drawing the potentiometric contours in proximity to RE137. Linear interpretation of water elevations between observation well pairs were used for locating and orienting the contours at more distant locations from RE137. The resulting potentiometric surfaces indicate the cone of depression created by RE137 pumping in each aquifer zone. A line approximating the dividing flow line around RE137 was drawn to represent the observed capture zone for each aquifer depth zone. This line begins at the stagnation point and extended upgradient to intersect the potentiometric contours at right angles. Capture zone dimensions for the stagnation point distance, the total capture zone width perpendicular to RE137, and 3,300 ft upgradient from RE137 (near well RE108) for the observed capture zones are summarized in Table 6-5.

Due to the absence of observation wells at cross gradient locations upgradient and west of RE137 and the influence of pumping at BWD 6-2, extension of the contours to the east and west of the t = 0 minutes gradient flow line through RE137 was based on limited data and includes significant uncertainty; the contours are dashed in these areas of Figures 6-7 through 6-9. While the contours to the east were partially bounded by water level data at RE122, RE108 and MW117-5, the extrapolated azimuth of the contours with respect to the t = 0 minutes gradient flow line greatly impacts the location of the dividing flow line that represents the capture zone, that is, more or less curvature in the contour lines greatly effects the width of the capture zone. Since control was limited to the east and to the west, a conservative approach was used to extrapolate the curvature of the contours (i.e, away from RE137 the contours were drawn to approximate the background gradient, thus limiting the width of the dividing flow line). Furthermore, as seen on the figures, deflection of the contours to the east resulting from BWD 6-2 pumping strongly impacts the width of the capture zone. The observation well density immediately surrounding RE137 is somewhat greater, and the observed data coupled with the modeled stagnation point and pumping water levels were considered good control for the contours immediately around the well. The resulting uncertainty in the upgradient width of the capture zone is addressed further in the following section for the analytical capture zone. However, use of the ambient gradient to draw contours in areas of poor control has likely resulted in underestimation of the observed capture zone width.

The size and extent of the observed capture zones shown in Figures 6-7 through 6-9 and the capture zone dimensions summarized in Table 6-5 indicate that pumping at RE137 had the greatest impact in the intermediate aquifer zone (625 to 710 ft bgs), a slightly diminished impact in the deep aquifer zone (710 to 760 ft bgs), and the least impact upward in the shallow aquifer zone (520 to 610 ft bgs). In support of these findings, the drawdowns that occurred in the shallow, intermediate, and deep aquifer zones during the constant rate test were mapped for t = 480 minutes. The water level data and calculated drawdowns are provided in Table 6-1. Using the observed drawdown data, the area where 1-foot of drawdown due to pumping at RE137 was observed in each aquifer depth zone was mapped on Figure 6-10. The areal extent of drawdown is shown to be relatively larger in the intermediate aquifer zone, smaller in the deep aquifer zone, and smallest in the shallow aquifer zone. The upward reduction in the size of the 1-foot drawdown area is expected due to the partial penetration of the aquifer by RE137 (it is screened across the intermediate and deep zones) and both the upward and downward reductions in drawdown may result from aquifer anisotropy, i.e., the low vertical to horizontal conductivity ratios deducted from the aquifer pumping test analyses (see Table 5-1) and lateral heterogeneity of sediments in the Magothy aquifer.

6.2 Analytical Capture Zone Calculations

The analytical line of evidence for assessing the capture zone created by RE137 pumping utilized standard equations to calculate the dimensions of the capture zone. The analytical equation details and list of assumptions from the EPA guidance (2008) are presented in Figure 6-11. It is noted that these equations are applicable to homogeneous, isotropic, confined aquifers; a fully penetrating pumping well; and no other sources of water to the pumping well (e.g., leakage from above or below). The conditions required by the assumptions are not strictly satisfied by the local aquifer and construction of RE137; however, EPA guidance states that application of these equations may be valid if input values are carefully considered and adjusted when the assumptions are violated. As described below, the inputs used for these equations have been adjusted to account for site-specific conditions, and rationale is provided. In addition, the capture zone distance to the stagnation point shown in Table 6-5, based on modeling the pumping water levels, was used as an approximate calibration target for the analytical model results.

Input values for horizontal hydraulic conductivity were derived from the site-specific estimates of aquifer K provided in Table 5-1. The background hydraulic gradient for each aquifer zone was calculated from the t = 0 minutes potentiometric surface for a flow line passing through RE137 (see Figures 6-7 through 6-9). Aquifer properties (e.g., anisotropy) and partial aquifer penetration of RE137 were also considered in selecting input values. Because RE137 is screened across the intermediate and deep aquifer zones, the analysis was initially conducted for those zones combined with inputs modified to simulate a fully penetrating RE137. As shown in Table 6-5, a thickness of 148 ft was assigned that represents the intermediate/deep zone interval. A horizontal conductivity of 90 ft per day was used based on the average K for the intermediate/deep aquifer properties estimated from the aquifer pump test analysis (see Table 5-1). An average background gradient of 0.00125 was also used (range of 0.0011 to 0.0014). Using these inputs, a range of capture zone dimensions was calculated for a range of pumping rate scenarios because the flow contribution from only the intermediate/deep aquifer zone interval is unknown. The nominal flow rate of 741 gpm (average flow rate for constant rate test) is shown as a point of reference, but the vertical distribution of drawdown in the observation wells and the partial penetration of RE137 suggest that all of the flow to the well did not come from the intermediate/deep aquifer zone. Following EPA guidance (2008), flow factors of 1.5 (67%) and 2 (50%) were used to account for vertical flow from portions of the aquifer above and below the intermediate/deep aquifer zone interval and provide alternate capture zone scenarios. The calculated analytical stagnation point distance (i.e., capture zone downgradient [CZ, dwn]) shown in Table 6-5 for the 67 percent flow basis scenario was observed to approximate the distance shown in the table for the intermediate/deep aquifer zones observed capture zones. This similarity of the analytical equation result to the observed/modeled capture zone stagnation point distance provided an approximate calibration for the analytical equation flow input and indicates that 67 percent of the flow (496 gpm) to RE137 was extracted from the intermediate/deep interval in the aquifer. Table 6-5 also provides analytical estimates of the total capture zone width at the pumping well (CZ, well) and the total maximum capture zone width (CZ, max) located far upgradient of RE137 for the 67 percent flow basis scenario.

The above results of the analytical equations for the intermediate/deep aquifer zone and the local geology suggest that approximately 33 percent of the flow to RE137 was derived from portions of the aquifer overlying the screened interval of RE137 (i.e., shallow aquifer zone). This is consistent with the gamma log for RE137 that indicates the well is screened in and overlain by a high proportion of more permeable coarse-grained sediments, but underlain by less permeable, predominantly finer grained materials (see Figure 4-2). As was presented for the intermediate/deep aquifer zone, total capture widths calculated for the shallow aquifer zone at selected distances upgradient of RE137 are included in Table 6-5. Using 33 percent of flow from the shallow aquifer zone, the calculated capture zone widths are similar to the observed widths for the downgradient of (CZ, dwn) and perpendicular to RE137 (CZ, well) locations.

Because the maximum upgradient capture zone width is located far beyond the area of interest for RE137, the EPA equation for calculating the distance between the dividing streamlines (i.e., total capture zone width) at any distance upgradient of the pumping well (see Figure 6-11) was used to calculate the total capture zone width at selected distances upgradient of RE137 within the area of interest (i.e., at 3,300 ft, or approximately at well RE108). The results of this analysis are presented in Table 6-6 and show a capture zone width (CZ, 3,300) of 4,626 ft for the intermediate/deep aquifer zone and 3,128 ft for the shallow aquifer zone. The observed CZ, 3,300 widths are significantly less than these calculated values; however, as seen in Figures 6-7 through 6-9, the pumping at BWD 6-2 has greatly reduced the capture zone width to the east in all aquifer zones.

6.3 RE137 TCE Plume Capture

The capture zone areas described in Section 6.2 for the shallow and intermediate/deep aquifer zone depths are shown overlying the 1st quarter 2017 TCE plume maps for >500, >600, and >700 foot depths, respectively, in Figures 6-12 through 6-14. The placement of contours in the area of BWD 6-2 on these plume maps reflect the pumping impact of BWD 6-2, i.e., influent TCE concentrations for the well are typically greater than 1000 µg/L. These plume depth intervals overlap the aquifer depth zones used in this report (see Table 4-1). Both the observed and analytical capture zones are shown on the figures. The observed capture zones were transferred directly from Figures 6-7 through 6-9 and the analytical capture zones were plotted using the dimensions presented in Tables 6-5 and 6-6. The axis of each capture zone was aligned with the t=0 minutes flow direction line through RE137 shown in Figures 6-4 through 6-6.

It is noted that the analytical capture zone is wider than the observed capture zones for each aquifer depth zone. The smaller width of the observed capture zones reflect the previously noted uncertainty associated with extrapolating the observed potentiometric contours and the influence of pumping at BWD 6-2 (i.e., continuous pumping based on information obtained from BWD). Those uncertainties lead to what is considered to be conservative placement of the dividing flow line that delineates the observed capture zone dimensions. The analytical capture zones are independent of BWD 6-2 pumping and are deemed representative of potential plume capture when BWD 6-2 is not pumping. Based on the variation in the capture zone dimensions and in consideration of the different lines of evidence used to delineate the areas, it is surmised that the observed and analytical capture zones shown in Figures 6-12 through 6-14 represent the capture zones created by pumping RE137 at the nominal pumping rate used in the calculations when BWD 6-2 is and is not pumping.

The percent overlap of the capture zones with the 5 µg/L TCE plume contour for each aquifer depth zone indicates the potential for RE137 pumping at its nominal rate to capture the RE108 Hot Spot plume. The percent capture of the greater than 5 µg/L TCE for each depth zone is summarized below:

Aquifer Depth Zone (Plume Depth)	Figure Reference	Observed Percent Capture	Analytical Percent Capture
Shallow (>500 ft)	6-12	17	20
Intermediate (>600 ft)	6-13	28	41
Deep (>700 ft)	6-14	31	50

6.4 RE137 and BWD 6-2 Combined TCE Plume Capture

The observed and analytical capture zones and TCE plume capture described in the preceding sections focus on the impacts from pumping at RE137. As described for the RE137 testing intervals, BWD 6-2 was operating continuously at a nominal rate of 1,150 gpm (based on information provided by BWD) with short interruptions (based on water level information). While future operation of BWD 6-2 is not known, an analysis is herein presented to assess the combined capture zone when both RE137 and BWD 6-2 are pumping.

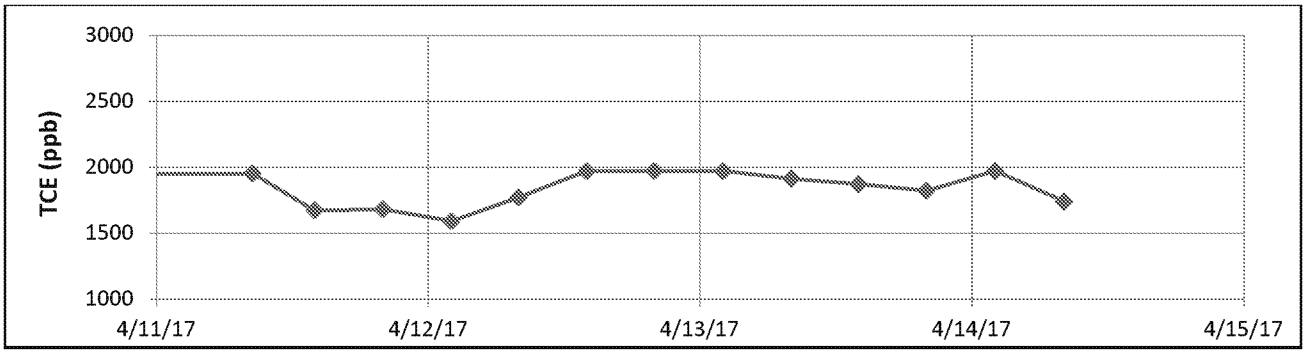
As demonstrated in the figures, the location and distribution of observation wells monitored during RE137 testing are not adequate to completely map the potentiometric surface around BWD 6-2 prior to RE137 pumping (Figures 6-4 through 6-6) or the potentiometric surface and combined capture zone from simultaneous pumping at RE137 and BWD 6-2 (Figures 6-7 through 6-9). However, the BWD 6-2 capture zone was previously mapped during the 2016 pilot study (see Section 3.2). Figure 6-15 presents the 2017 TCE plume contours, the deep aquifer observed capture zone for BWD 6-2 (Week #1; Resolution, 2016d), and the deep aquifer observed capture zone for R137 (transferred from Figure 6-14); the figure also provides an annotated combined capture zone for the two wells. The combined capture zone for the two wells indicates 59 percent capture of the TCE plume greater than 5 µg/L at a depth >700 bgs compared to the 31 percent shown above for RE137. It is noted that superposition of the capture zones from the independent pumping events is deemed likely to somewhat underestimate the singular, combined capture zone during simultaneous pumping at both wells. It is also noted that the increase in TCE plume capture provided by BWD 6-2 pumping is moderate (i.e., 9% increase) because BWD 6-2 is located near the far eastern margin of the TCE plume at >700 depth, and as a result, the increase in TCE plume capture is only slightly greater than the analytically calculated 50 percent capture shown above for RE137 pumping alone (compare blue combined capture zone line to orange analytical capture zone line on Figure 6-15).

Due to a lack of coverage, observed capture zones for the shallow and intermediate aquifer zones could not be drawn for BWD 6-2 during the 2016 pilot study, therefore combined capture zone figures and percentages are not presented for those TCE plume depths. As noted above for the deep aquifer zone, BWD 6-2 is also located near the far eastern margin of the TCE plumes shown for >500 and >600 ft bgs in the aquifer (see Figures 6-12 and 6-13). As was demonstrated for the deep aquifer zone, this suggests that the BWD 6-2 capture zone in these aquifer zones would only marginally increase the percent TCE plume capture compared to only RE137 pumping (i.e., the analytical capture zone for RE137).

7. ANALYTICAL SAMPLE RESULTS

As described in Section 4.4, samples of the raw groundwater extracted from the Magothy aquifer during pumping at RE137 (i.e., influent to the treatment system) and samples of the treated groundwater (i.e., effluent from the treatment system) were collected throughout the constant rate test and analyzed for VOCs, the known contaminants in the groundwater plume in the vicinity of RE137, as well as SVOCs, iron (total and dissolved), manganese (total and dissolved), total dissolved solids, total suspended solids, pH, biological oxygen demand, total kjeldahl nitrogen, and ammonia. The results of one post development influent sample collected on March 28, 2017 and of the influent/effluent sample pairs collected during the constant rate test are provided in Attachment E. Details regarding investigative derived waste, the treatment system, the discharge permit, samples collected prior to the constant rate test and analytical validation were provided under separate cover (i.e., the RE137 Installation Report).

The influent sample results for TCE during the constant rate test are summarized in Table 7-1 and a plot of TCE concentrations versus time is provided below. The baseline influent sample collected from RE137 on March 28, 2017, approximately one week following well development and two weeks prior to the constant rate test, showed a TCE concentration of 1,920 micrograms per liter (µg/L)(not shown below). Periodic sampling conducted during the constant rate pumping test at RE137 showed a TCE concentration range of 1,590 µg/L to 1,970 µg/L. The data indicate that the average TCE concentration in groundwater extracted by nominal pumping at RE137 will be about 1,837 µg/L for current site conditions.


3000
2500
2000
1500
1000
TCE (ppb)
4/11/17
4/12/17
4/13/17
4/14/17
4/15/17

8. CONCLUSIONS

Step and constant-rate pumping tests were conducted at RE137 between April 10 and 14, 2017, per the WE80 Work Plan (Resolution, 2016c). Recovered groundwater was treated to meet permit requirements and discharged to Nassau County Sump #305 located adjacent to RE137. Water levels were monitored using electronic data loggers at 18 observation wells in the Magothy aquifer surrounding RE137 throughout the test pumping cycles. The water level data, along with pumping water levels recorded in RE137, were used to perform both well and aquifer test analyses and to estimate both well and aquifer properties, and the hydraulic capture zone created by pumping at RE137. Analysis of the step test data indicated that RE137 is a highly efficient well (94 percent efficient) with a low well skin loss factor and negligible turbulent well loss (Figure D-4).

The observation wells and RE137 were constructed with well screens between depths of 520 to 760 ft bgs in the Magothy aquifer (Figure 4-2). Because of known aquifer anisotropy and heterogeneity, the observation wells were grouped into shallow, intermediate, and deep aquifer zones for aquifer characterization and capture zone analyses. The AQTESOLV computer program was used to evaluate the water level responses to pumping at RE137 and deduce well efficiency from the step and aquifer hydraulic properties from the constant rate test. The well responses for each aquifer depth zone were evaluated versus time of pumping using type curves representing a leaky, confined aquifer model. The automatic curve matching feature of the AQTESOLV modeling program along with professional judgement were used to determine the best fit of the type curves to the water levels for each group of observation wells and aquifer parameters of transmissivity and storativity were calculated for each aquifer zone. The results for all aquifer depth zones were similar, and Magothy aquifer properties based on these data in the vicinity of RE137 are shown below.

Aquifer Zone	Transmissivity (T, ft2/day)	Storativity (S)	1/B (leakage factor)	Kz/Kr (vertical to radial hydraulic conductivity ratio)	Kr (ft/day)
Shallow	44,850	0.0014	0.0002	0.0294	77
Intermediate	53,330	0.0011	0.0003	0.0005	92
Deep	50,930	0.0015	0.0003	0.0013	88
Magothy	**49,234**	**0.0013**	**0.0003**	**0.013**	**85**

Estimates of the hydraulic capture zone created by pumping at RE137 were evaluated using two approaches: 1) mapping observed and modeled water levels to derive the potentiometric surface for each aquifer depth zone and mapping the capture zone based on groundwater flow lines and 2) applying standard analytical equations using the local aquifer properties , the background hydraulic gradient, and a pumping rate representative of the partial penetration of RE137 to estimate the dimensions of the capture zone for various aquifer depth zones. A summary of the capture zone dimensions using each of the two methods is shown below.

Capture Zone Method and Aquifer Zone	**Observed: BWD 6-2 Pumping**			**Analytical: BWD 6-2 Not Pumping**		
	CZ, dwn	CZ, well	CZ, 3300	CZ, dwn	CZ, well	CZ, 3300
Shallow (>500 ft bgs)	650	1,540	2,540	579	1,820	3,128
Intermediate (>600 ft bgs)	1,200	2,010	1,950	914	2,870	4,626
Deep (>700 ft bgs)	1,100	1,920	1,624	914	2,870	4,626

Notes: CZ – capture zone; nominal pumping rate of 741 gpm
All distances are from RE137
CZ, dwn = downgradient extent of capture zone at pumping well, i.e., distance to stagnation point.
CZ, well = total capture zone width at pumping well.
CZ, 3300 = total capture zone width 3,300 ft upgradient of RE137, near well RE108.

The potential for using RE137 to capture the RE108 Hot Spot VOC plume area was evaluated by overlaying the observed and analytical capture zones on the most recent interpretations of the extent of the TCE plume during BWD 6-2 pumping for aquifer depth intervals of >500, >600, and >700 ft bgs. Figures 6-12 through 6-14 show the locations and dimensions of the shallow, intermediate, and deep capture zones along with the TCE plume concentration contours at correlative aquifer depths. These correlations indicate that continuous pumping at RE137 at a nominal rate of 741 gpm would capture a maximum of 20, 41, and 50 percent of the RE108 Hot Spot TCE plume with concentrations greater than 5 µg/L at depths of >500, >600, and >700 ft, respectively. These maximum percentages reflect a "no continuous pumping" condition for BWD 6-

2; this well was shown by the observed water level data to significantly decrease the RE137 capture zone. A comparison was also presented to assess the TCE plume capture potential for RE137 pumping alone or together with BWD 6-2. Because BWD 6-2 is located near the far eastern margin of the TCE plume in all aquifer depth zones evaluated, the assessment indicated only a moderate increase in plume capture was likely for the wells operating together verses RE137 pumping alone. However, the widespread hydraulic influence of pumping at local BWD supply wells, documented during this and previous studies (Resolution, 2016d), indicates that the shape, size, and persistence of the capture zone achieved by RE137 will be dependent upon pumping cycles at the BWD supply wells.

Groundwater samples were collected to monitor performance of the groundwater treatment system used during the constant rate aquifer test performed at RE137. The influent groundwater sample results during the constant rate test showed a range of 1,590 ug/L to 1,970 ug/L of TCE extracted from the aquifer. The data indicates that the average TCE concentration in groundwater extracted by nominal pumping at RE137 will be about 1,837 ug/L for current site conditions.

9. REFERENCES

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ATTACHMENTS

A Cross Sections, RE137 Geologist Log, VPB171 Gamma Log, and ESS Report
B Pumping Well Records
C Well Hydrographs
D Drawdown Hydrographs, Well and Aquifer Test Analyses, Hantush-Jacob solution for a pumping test in a leaky aquifer, and Hantush-Jacob stepdown test in a leaky aquifer
E Groundwater Results Summary

TABLES

Table 4-1. Well Construction and Location Details
NWIRP, Bethpage, NY

Aquifer Zone	Well	X	Y	Geographic Azimuth From RE137	Distance to RE137 (ft)	TOC Elevation (ft amsl)	Ground Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom Screen (ft bgs)	Mid Screen (ft bgs)	Total Depth (ft bgs)	Top screen Elevation (ft amsl)	Bott. screen Elevation (ft amsl)
Interm.-Deep	**RE137**	**1125692**	**204416**	0	**0**	--	**86**	**630**	**745**	**688**	**750**	**-544**	**-659**
Interm.-Deep	BWD 5-1	1129164	205008	80	3522	--	92	679	740	710	385	-587	-648
Shallow	BWD 6-1	1126784	206200	31	2092	--	92	330	380	355	386	-238	-288
Interm.-Deep	BWD 6-2	1126673	206174	29	2013	--	92	700	770	735	775	-608	-678
Shallow	TT101D1	1125484	203545	193	871	80.92	81.60	570	590	580	595	-488.40	-508.4
	RE105D1	1126664	205073	56	1190	87.23	87.62	530	550	540	555	-442.38	-462.38
	RE108D1	1125500	207665	357	3257	95.38	95.68	530	550	540	545	-434.32	-454.32
	RE122D2	1124979	207789	348	3470	97.35	97.70	590	610	600	615	-492.30	-512.3
	RE122D1	1124982	207818	348	3498	97.42	97.74	520	540	530	545	-422.26	-442.26
Intermediate	RE120D1	1125061	204590	285	658	85.58	86.06	630	650	640	655	-543.94	-563.94
	RE103D2	1125160	206693	347	2361	92.73	93.63	653	673	663	673	-559.37	-579.37
	RE103D1	1125112	206695	346	2373	93.00	93.80	625	640	632.5	645	-531.20	-546.2
	RE108D2	1125484	207663	356	3277	95.43	95.72	630	650	640	655	-534.28	-554.28
	RE107D3	1123760	208495	335	4534	99.96	100.61	645	665	655	670	-544.39	-564.39
	RE120D2	1125060	204577	284	655	85.54	86.03	690	710	700	713	-603.97	-623.97
Deep	RE120D3	1125062	204618	288	666	85.70	86.14	740	760	750	765	-653.86	-673.86
	TT101D2	1125454	203545	195	879	80.89	81.75	740	760	750	765	-658.25	-678.25
	RE105D2	1126652	205064	56	1175	87.18	87.59	730	750	740	755	-642.41	-662.41
	RE121D2	1126664	203003	145	1697	79.24	79.61	730	750	740	755	-650.39	-670.39
	RE103D3	1125145	206693	346	2365	92.76	93.74	715	730	722.5	735	-621.26	-636.26
	MW117-5	1127141	206924	30	2919	93.15	94.80	737	757	747	762	-642.20	-662.2
	RE104D2	1127709	207000	38	3299	90.12	90.79	710	730	720	735	-619.21	-639.21
	RE122D3	1124981	207775	348	3456	97.27	97.62	715	735	725	740	-617.38	-637.38

Table 5-1. Aquifer Parameters Developed From RE137 Pumping
NWIRP, Bethpage, NY

Test Conducted	Estimated Aquifer Parameters						
	Data Used	**T**	**S**	**1/B**	**Kz/Kr**	**K**	**Comments** Leaky aquifer 580 ft thickness; Zones: Deep = 48 ft; Interm. = 100 ft; Shallow = 112 ft)
RE137 Step Test	3-step test	61,760	0.0011	0.0004	na	106	Pumping intervals of 100, 200, and 300 gpm at approximately 120 minutes each; Well efficiency estimated to be 95%
RE137 Constant Rate Test	RE137 only	50,580	0.001	0.0003	0.0036	87	Test conducted at an average of 741 gpm for 4300 minutes (3 days); Analysis using only time/drawdown in well RE137
	Shallow Zone	44,850	0.0014	0.0002	0.0294	77	5 observation wells (screened 520 to 610 ft bgs)
	Interm. Zone	53,330	0.0011	0.0003	0.0005	92	6 observation wells (screened 625 to 710 ft bgs)
	Deep Zone	50,930	0.0015	0.0003	0.0013	88	8 observation wells (screened 710 to 760 ft bgs)
	Aquifer Composite	**49,234**	**0.0013**	**0.0003**	**0.013**	**85**	Thickness weighted average for 3 zones

Notes:

T - Transmissivity, ft^2/day

S - Storativity, dimensionless

1/B - Leakage factor, dimensionless

Kz/Kr - Ratio of vertical to radial (i.e., horizontal) hydraulic conductivity

K - Horizontal hydraulic conductivity, ft/day

Zone averages for composite aquifer based on thickness weighted average of all three zones

Table 6-1. Observed Water Levels and Drawdown
NWIRP, Bethpage, NY

Wells	Elevation TOC	Aquifer Depth Zone	WLs, ft amsl 3/10/17 5:15 am Background	WLs, ft amsl 4/11/2017 8:05 am Start of Test	WLs, ft amsl 4/11/2017 4:00 pm 8 hrs After Test Start	Drawdown At 8 hours, feet
TT101D1	80.89	Shallow (S)	--	43.37	42.24	1.14
RE105D1	87.23		47.61	46.31	45.51	0.80
RE108D1	95.38		52.04	51.27	50.99	0.28
RE114D1	80.89		41.21	--	--	--
RE122D1	97.42		52.37	51.75	51.57	0.19
RE122D2	97.35		52.05	51.28	50.97	0.31
RE122D1,2	***97.39***		***52.21***	***51.52***	***51.27***	***0.25***
RE120D1	85.58	Intermedaite (I)	46.98	45.85	43.48	2.38
RE120D2	85.54		47.14	45.88	43.29	2.59
RE120D1,2	***85.56***		***47.06***	***45.87***	***43.38***	***2.48***
RE103D1	93		50.71	48.83	48.21	0.61
RE103D2	92.73		50.02	48.00	47.38	0.62
RE103D1,2	***92.865***		***50.36***	***48.41***	***47.80***	***0.61***
RE108D2	95.43		51.74	50.35	50.01	0.34
RE107D3	98.99		53.68	53.54	53.36	0.18
RE120D3	85.7	Deep (D)	46.83	45.22	44.03	1.19
RE105D2	87.18		46.94	42.88	41.73	1.16
RE121D2	79.24		--	42.79	41.98	0.81
RE103D3	92.76		51.05	48.38	47.87	0.51
MW117-5	93.15		49.59	44.21	44.00	0.21
RE104D2	90.12		--	--	--	--
RE122D3	97.27		51.63	49.69	49.44	0.25
TT101D2	80.92		--	43.35	41.90	1.44
RE114D3	80.92		41.00	--	--	--
RE137	85.15	D & I	--	44.4	27.7	16.7
RE137	85.15	S	--	46.1	30.6	15.5
BWD 6-2	--	S, I, D	--	20	20	30
BWD 5-1	--	S, I, D	--	--	--	--

Notes:

Shaded cells are locations with two wells in same depth zone; average *in* ***bold italics*** *used on figures*

RE114 only used for background

TOC - top of well casing

WL - water level

ft amsl - feet above mean sea level

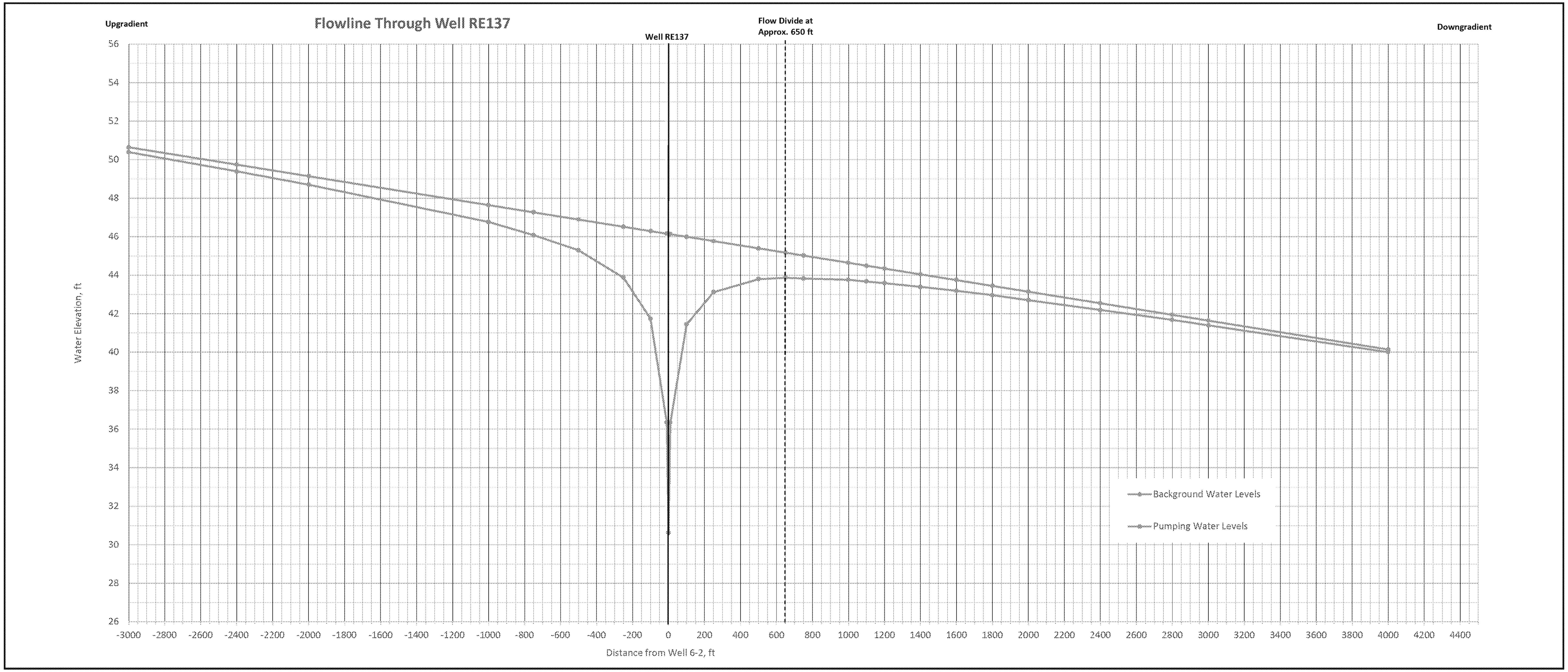
-- data not available

Table 6-2. Drawdown and Pumping Water Levels, Shallow Aquifer Zone
NWIRP, Bethpage, NY

Drawdown Plot Input Data

Obs. Pt.	#1	#2	#3	#4	#5	#6	#7	#8	#9	RE137	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26
Distance, ft	-3000	-2400	-2000	-1000	-750	-500	-250	-100	-10	**0**	10	100	250	500	**650**	750	1000	1100	1200	1400	1600	1800	2000	2400	2800	3000	4000
BWL, ft	50.64	49.74	49.14	47.64	47.27	46.89	46.52	46.29	46.16	**46.14**	46.13	45.99	45.77	45.39	**45.17**	45.02	44.64	44.49	44.34	44.04	43.74	43.44	43.14	42.54	41.94	41.64	40.14
Ddn, ft	0.25	0.35	0.44	0.88	1.19	1.60	2.65	4.55	9.80	**15.53**	9.80	4.55	2.65	1.60	**1.30**	1.19	0.88	0.82	0.76	0.65	0.55	0.48	0.44	0.35	0.26	0.25	0.14
PWL, ft	50.39	49.39	48.70	46.76	46.08	45.29	43.87	41.74	36.36	**30.61**	36.33	41.44	43.12	43.79	**43.87**	43.83	43.76	43.67	43.58	43.39	43.19	42.96	42.70	42.19	41.68	41.39	40.00

Gradient = 0.0015 background gradient for t = 0 mins based on flowline through RE137 (see Figure 6-4)
BWL - Background water level for t = 0 mins calculated using background gradient and distance to Observation Point (Obs pt.) from pumping well RE137.
Ddn - Drawdown due to CR pumping at well RE137; taken from t = 480 mins distance-drawdown plot generated using Hantush-Jacob (1955)/Hantush (1962) Leaky Aquifer Model in AQTESOLV.
PWL - Pumping water level is BWL minus Ddn at each observation point.
Bold red values represent water levels and drawdown at well RE137
Bold shaded values represent stagnation point downgradient from well RE137.



Drawdown Plot Data Used to Support t = 480 minutes Potentiometric Surface Contours (see Figure 6-7)

Elevation, ft	49	48	47	46	45	44	43.5	43	42	**30.61**	42	43	43.5	**43.87**	43.5	43	42
Distance, ft	-2200	-1650	-1120	-750	-450	-260	-225	-185	-120	**0**	150	240	400	**650**	1300	1790	2550

Values read from PWL plot and fall on groundwater flow line through well RE137.
Bold red values represent Water Elevation during pumping at well RE137 for t = 480 minutes.
Bold shaded values represent downgradient stagnation point from well RE137.
Negative distance indicates upgradient from well RE137; positive is downgradient.

Table 6-3. Drawdown and Pumping Water Levels, Intermediate Aquifer Zone
NWIRP, Bethpage, NY

Drawdown Plot Input Data

Obs. Pt.	#1	#2	#3	#4	#5	#6	#7	#8	#9	RE137	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26
Distance, ft	-3000	-2400	-2000	-1000	-750	-500	-250	-100	-10	**0**	10	100	250	500	650	750	1000	1100	**1200**	1400	1600	1800	2000	2400	2800	3000	4000
BWL, ft	48.61	47.77	47.21	45.81	45.46	45.11	44.76	44.55	44.42	**44.41**	44.40	44.27	44.06	43.71	43.50	43.36	43.01	42.87	**42.73**	42.45	42.17	41.89	41.61	41.05	40.49	40.21	38.81
Ddn, ft	0.52	0.74	0.95	1.97	2.40	3.08	4.55	6.40	11.00	**15.78**	11.00	6.40	4.55	3.08	2.66	2.40	1.97	1.82	**1.67**	1.44	1.25	1.08	0.95	0.74	0.56	0.52	0.30
PWL, ft	48.09	47.03	46.26	43.84	43.06	42.03	40.21	38.15	33.42	**28.63**	33.40	37.87	39.51	40.63	40.84	40.96	41.04	41.05	**41.06**	41.01	40.92	40.81	40.66	40.31	39.93	39.69	38.51

Gradient = 0.0014 background gradient for t = 0 mins based on flowline through RE137 (see Figure 6-5)

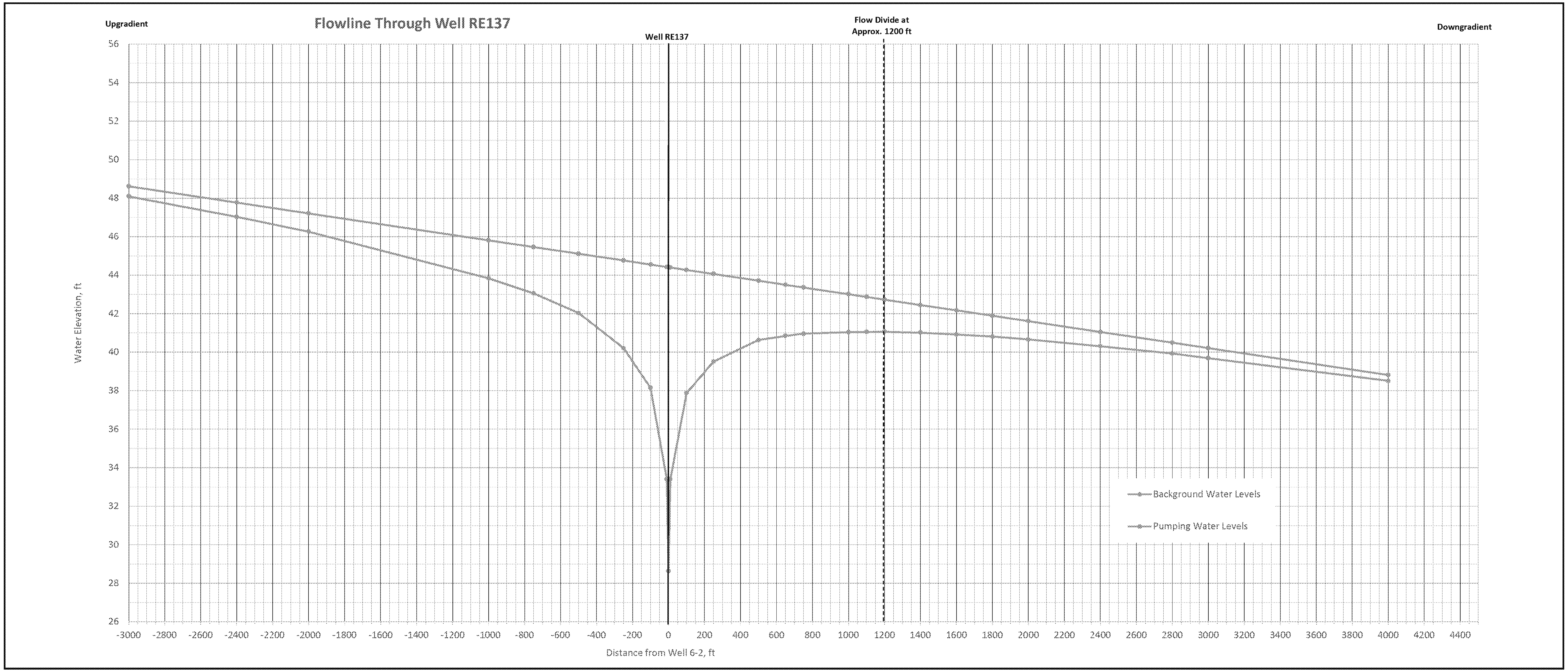
BWL - Background water level for t = 0 mins calculated using background gradient and distance to Observation Point (Obs pt.) from pumping well RE137.

Ddn - Drawdown due to CR pumping at well RE137; taken from t = 480 mins distance-drawdown plot generated using Hantush-Jacob (1955)/Hantush (1962) Leaky Aquifer Model in AQTESOLV.

PWL - Pumping water level is BWL minus Ddn at each observation point.

Bold red values represent water levels and drawdown at well RE137

Bold shaded values represent stagnation point downgradient from well RE137.



Drawdown Plot Data Used to Support t = 480 minutes Potentiometric Surface Contours (see Figure 6-8)

Elevation, ft	43	42	41	40	28.63	40	41	**41.06**	41	40
Distance, ft	-750	-500	-350	-230	0	370	900	**1200**	1450	2720

Values read from PWL plot and fall on groundwater flow line through well RE137.

Bold red values represent Water Elevation during pumping at well RE137 for t = 480 minutes.

Bold shaded values represent downgradient stagnation point from well RE137.

Negative distance indicates upgradient from well RE137; positive is downgradient.

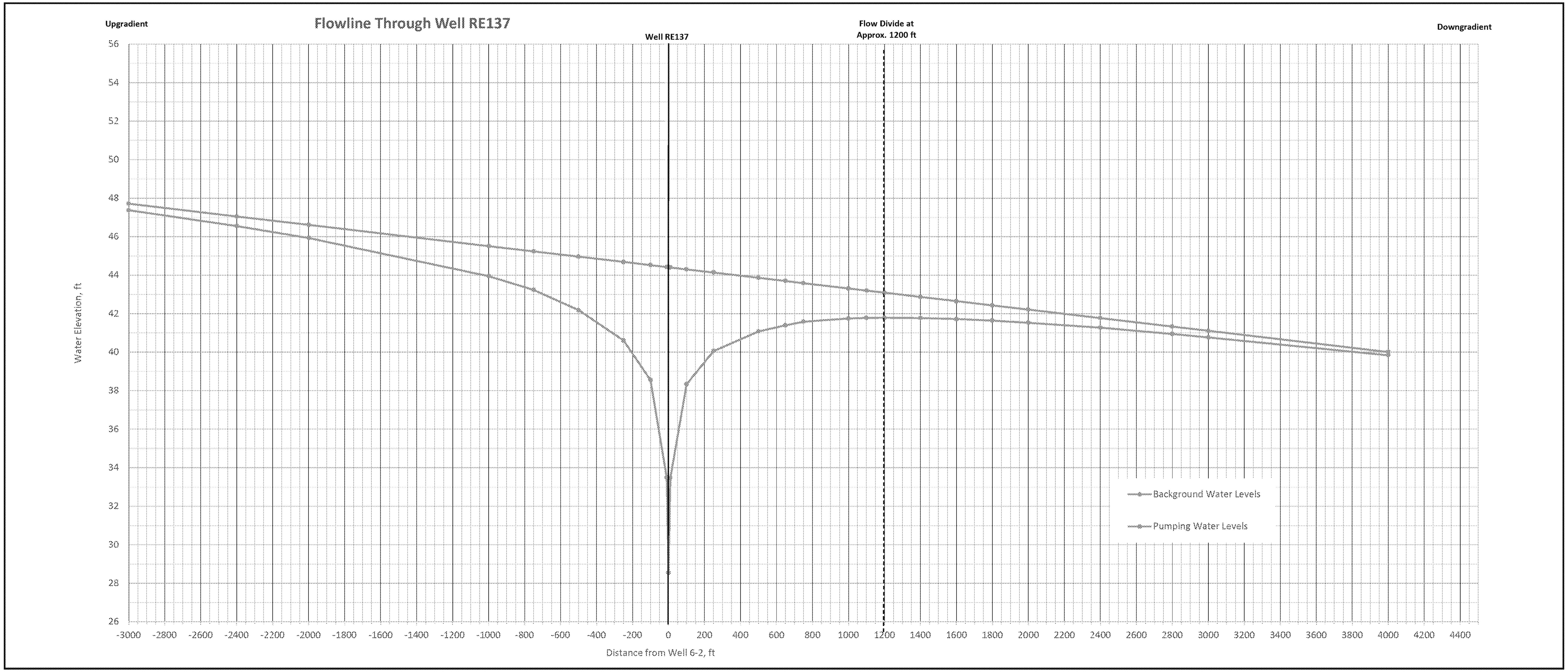
Table 6-4. Drawdown and Pumping Water Levels, Deep Aquifer Zone
NWIRP, Bethpage, NY

Drawdown Plot Input Data

Obs. Pt.	#1	#2	#3	#4	#5	#6	#7	#8	#9	RE137	#10	#11	#12
Distance, ft	-3000	-2400	-2000	-1000	-750	-500	-250	-100	-10	0	10	100	250
BWL, ft	47.71	47.05	46.61	45.51	45.24	44.96	44.69	44.52	44.42	44.41	44.40	44.30	44.14
Ddn, ft	0.34	0.50	0.68	1.56	2.00	2.78	4.08	5.97	10.94	15.86	10.94	5.97	4.08
PWL, ft	47.37	46.55	45.93	43.95	43.24	42.18	40.61	38.55	33.48	28.55	33.46	38.33	40.06

Obs. Pt.	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26
Distance, ft	500	650	750	1000	1100	**1200**	1400	1600	1800	2000	2400	2800	3000	4000
BWL, ft	43.86	43.70	43.59	43.31	43.20	**43.09**	42.87	42.65	42.43	42.21	41.77	41.33	41.11	40.01
Ddn, ft	2.78	2.30	2.00	1.56	1.42	**1.30**	1.10	0.93	0.79	0.68	0.50	0.39	0.34	0.17
PWL, ft	41.08	41.40	41.59	41.75	41.78	**41.79**	41.77	41.72	41.64	41.53	41.27	40.94	40.77	39.84

Gradient = 0.0011 background gradient for t = 0 mins based on flowline through RE137 (see Figure 6-6)
BWL - Background water level for t = 0 mins calculated using background gradient and distance to Observation Point (Obs pt.) from pumping well RE137.
Ddn - Drawdown due to CR pumping at well RE137; taken from t = 480 mins distance-drawdown plot generated using Hantush-Jacob (1955)/Hantush (1962) Leaky Aquifer Model in AQTESOLV.
PWL - Pumping water level is BWL minus Ddn at each observation point.
Bold red values represent water levels and drawdown at well RE137
Bold shaded values represent stagnation point downgradient from well RE137.



Drawdown Plot Data Used to Support t = 480 minutes Potentiometric Surface Contours (see Figure 6-9)

Elevation, ft	43	42	41	40	28.55	40	41	**41.8**	41
Distance, ft	-700	-470	-320	-210	0	250	470	**1200**	2800

Values read from PWL plot and fall on groundwater flow line through well RE137.
Bold red values represent Water Elevation during pumping at well RE137 for t = 480 minutes.
Bold shaded values represent downgradient stagnation point from well RE137.
Negative distance indicates upgradient from well RE137; positive is downgradient.

Table 6-5. Observed and Analytical Capture Zone Summary
NWIRP, Bethpage, NY

Observed Capture Zone[1]							
Aquifer Depth Zone	i[2]	Q, gpm[3]	Q, ft3/d	CZ, dwn[4]	Cz, well[5]	CZ, 3300[6]	CZ, max[7]
Shallow	0.0015	741	142,652	650	1,540	2,540	na
Intermediate	0.0014			1,200	2,010	1,950	na
Deep	0.0011			1,100	1,818	1,624	na

1 Based on observed water levels and distance vs. drawdown modeling.
2 Gradient, i, calculated from potentiometric surface contours before pumping began, t=0 minutes (see Figures 6-4 through 6-6).
3 Constant rate test pumping rate for RE137.
4 CZ, dwn = downgradient extent of capture zone at pumping well, see stagnation point on Figures 6-7 through 6-9; distance based on calculated pumping water levels.
5 CZ, well = total capture zone width at pumping well; estimated by placement of dividing flow line on pumping potentiometric surface (see Figures 6-7 through 6-9).
6 CZ, 3300 = total capture zone width 3300 ft upgradient of RE137, near well RE108; estimated from potentiometric surface (see Figures 6-7 through 6-9).
7 CZ, max = total maximum capture zone width far upgradient of pumping well; could not be estimated from observed potentiometric surface.

Analytical Capture Zone										
Zone	Thickness b, ft[1]	K ft/day[2]	T = kb	i[3]	Q basis[4]	Q, gpm[4]	Q, ft3/d	CZ, dwn[5]	Cz, well[6]	CZ, max[7]
Shallow	112	77	8,624	0.0015	33%	245	47,075	579	1,820	3,639
Intermediate and Deep	148	90	13,320	0.00125	nominal	741	142,652	1,364	4,284	8,568
					67%	496	95,577	914	2,870	5,740
					50%	371	71,326	682	2,142	4,284

1 Thickness for aquifer depth zones for which aquifer parameters derived (see Table 5-1).
2 Horizontal hydraulic conductivity, K, based on bulk aquifer property from pumping test analyses (see Table 5-1).
3 Gradient, i,for each aquifer depth zone potentiometric surface at t = 0 minutes (see Figures 6-4 through 6-6).
4 Q basis was nominal pumping rate for constant rate test (741 gpm), or specified percentage of nominal flow;
Q basis for shallow zone is assumed equal to remainder of nominal flow not coming from intermediate/deep zone.
5 CZ, dwn = $(Q/2\pi Ti)$, downgradient extent of capture zone parallel to flow direction at pumping well.
6 CZ, well = $(2)(Q/4Ti)$, total capture zone width perpendicular to flow direction at pumping well.
7 CZ, max = $(2)(Q/2Ti)$, total maximum capture zone width far upgradient of pumping well.

Table 6-6. Calculation of Capture Zone Width Upgradient of Pumping Well
NWIRP, Bethpage, NY

Calculation of upgradient CZ width as a function of distance along flow line through RE137: Shallow Aquifer Zone

T =	8,624	ft/day	Shallow zone K x b (see Table 6-5 Analytical Capture Zone)
Q =	47,075	ft3/day	RE137
i =	0.0015		background average for t = 0 mins

Ymax = Q/2Ti = 1820 max up-gradinet CZ width (EPA, 2008)

$$x = \frac{-y}{\tan[(2\pi Ti/Q)(y)]}$$ (EPA, 2008)

if ±y =	1,564
x up-grad =	3,300
CZ width =	**3,128**

Note: multiply "y" by 2 to get total capture zone width.

Calculation of upgradient CZ width as a function of distance along flow line through RE137: Intermediate/Deep Aquifer Zone

T =	13,320	ft/day	Intermediate/Deep zone K x b (see Table 6-5 Analyitcal Capture Zone)
Q =	95,577	ft3/day	RE137
i =	0.00125		background average for t = 0 mins

Ymax = Q/2Ti = 2870 max up-gradinet CZ width (EPA, 2008)

$$x = \frac{-y}{\tan[(2\pi Ti/Q)(y)]}$$ (EPA, 2008)

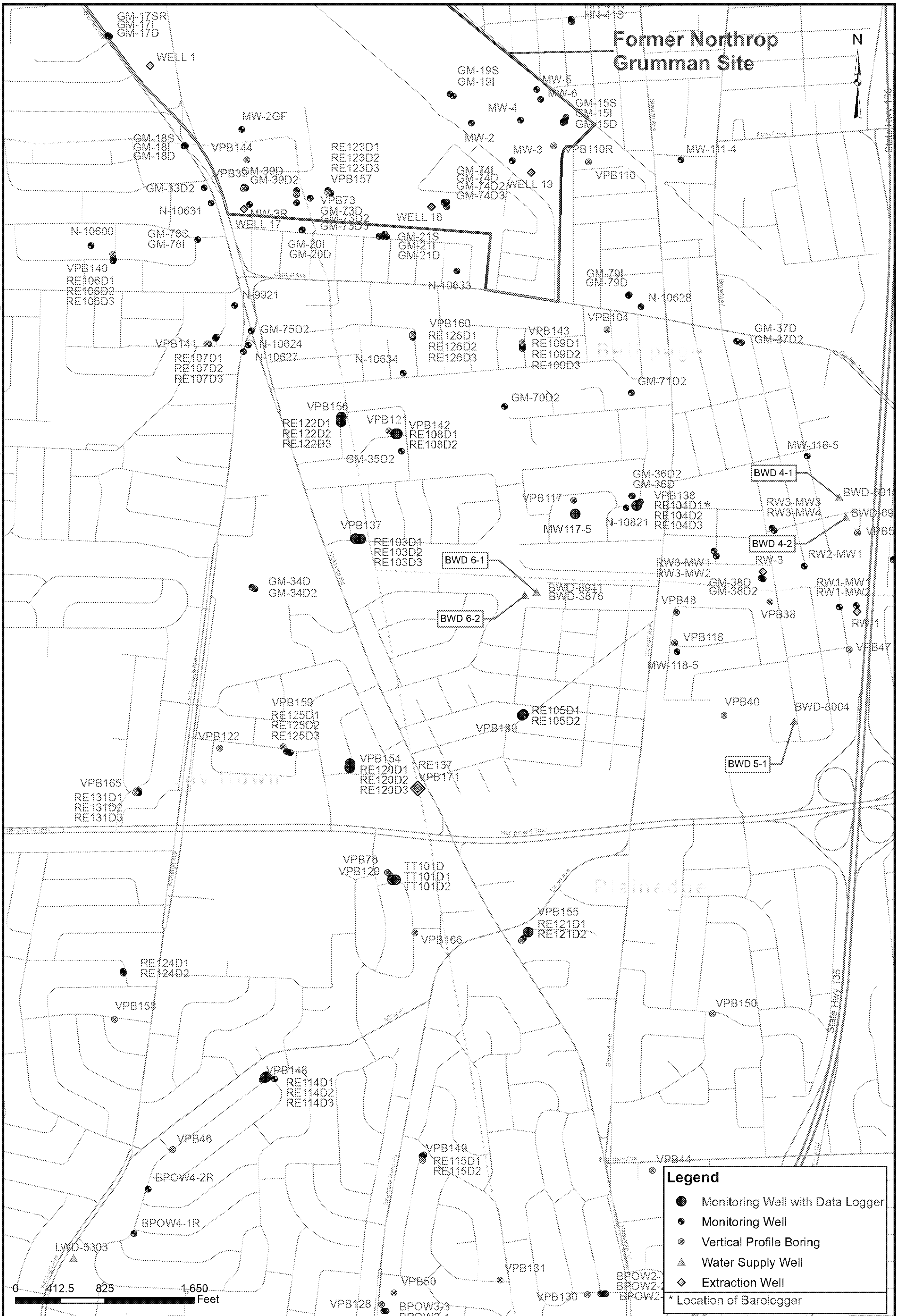
if ±y =	2,313
x up-grad =	3,300
CZ width =	**4,626**

Note: multiply "y" by 2 to get total capture zone width.

Table 7-1. TCE Results in Groundwater from RE137
NWIRP, Bethpage, NY

Date	Time	Sample ID	TCE ug/L	Sample Event
3/28/17	2:00 PM	RE137-GW-032817-INF	1,920	Baseline
4/11/17	8:30 AM	RE137-INF-041117-0830	1,950	Constant Rate Test
4/11/17	2:00 PM	RE137-INF-041117-1400	1,670	
4/11/17	8:00 PM	RE137-INF-041117-2000	1,680	
4/12/17	2:05 AM	RE137-INF-041217-0205	1,590	
4/12/17	8:00 AM	RE137-INF-041217-0800	1,770	
4/12/17	2:00 PM	RE137-INF-041217-1400	1,970	
4/12/17	8:00 PM	RE137-INF-041217-2000	1,970	
4/13/17	2:05 AM	RE137-INF-041317-0205	1,970	
4/13/17	8:05 AM	RE137-INF-041317-0805	1,910	
4/13/17	2:00 PM	RE137-INF-041317-1400	1,870	
4/13/17	8:00 PM	RE137-INF-041317-2000	1,820	
4/14/17	2:05 AM	RE137-INF-041417-0205	1,970	
4/14/17	8:10 AM	RE137-INF-041417-0810	1,740	

FIGURES



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WELL LOCATION MAP

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE80
APPROVED BY	DATE
AJ	10/5/2017
APPROVED BY	DATE
—	—
FIGURE NO. 4-1	REV 0

Figure 4-2. Hydrogeologic Conceptual Model, RE137 Pumping Tests
NWIRP, Bethpage, NY

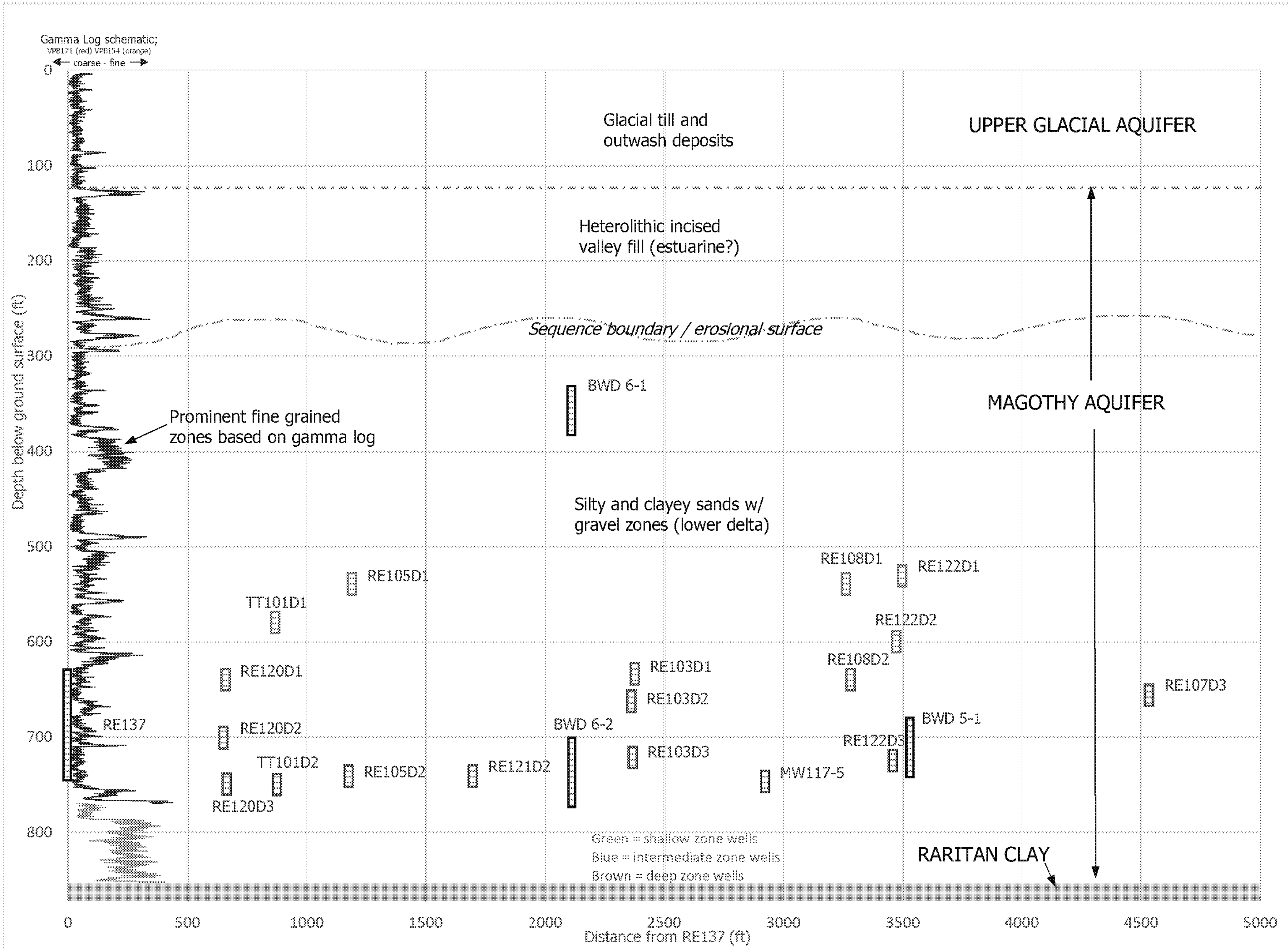
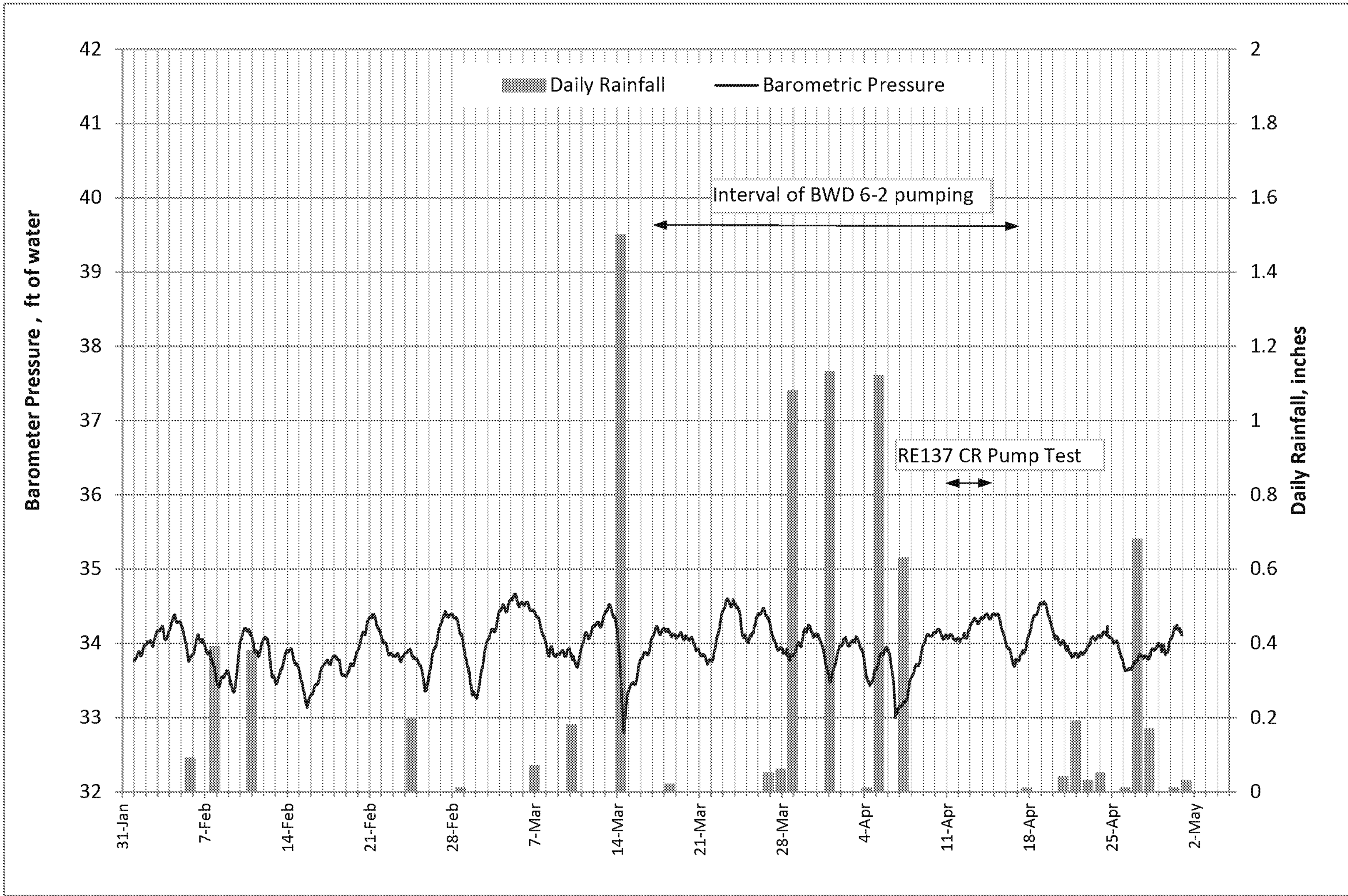
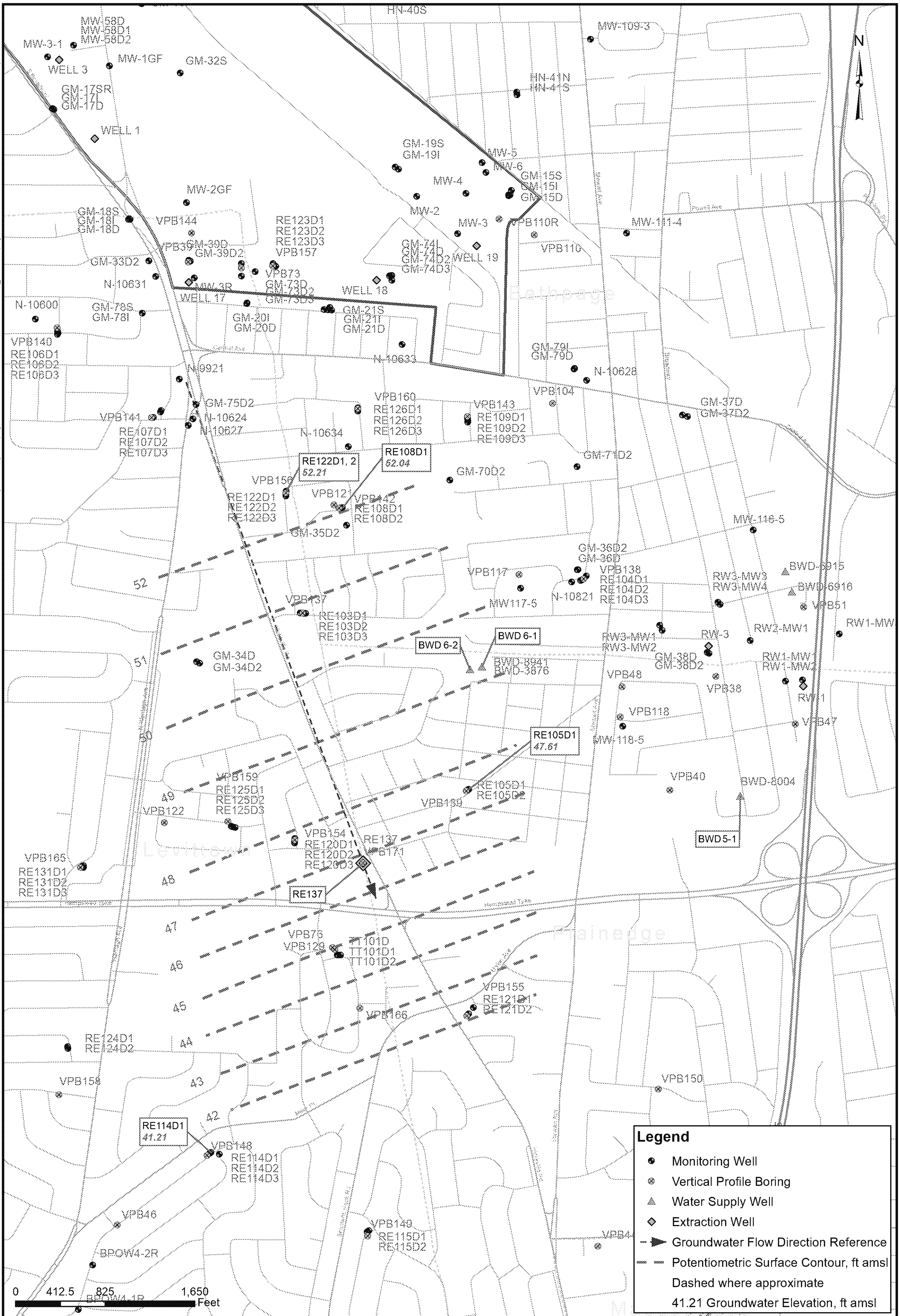


Figure 5-1. Daily Rainfall and Barometric Pressure
NWIRP, Bethpage, NY





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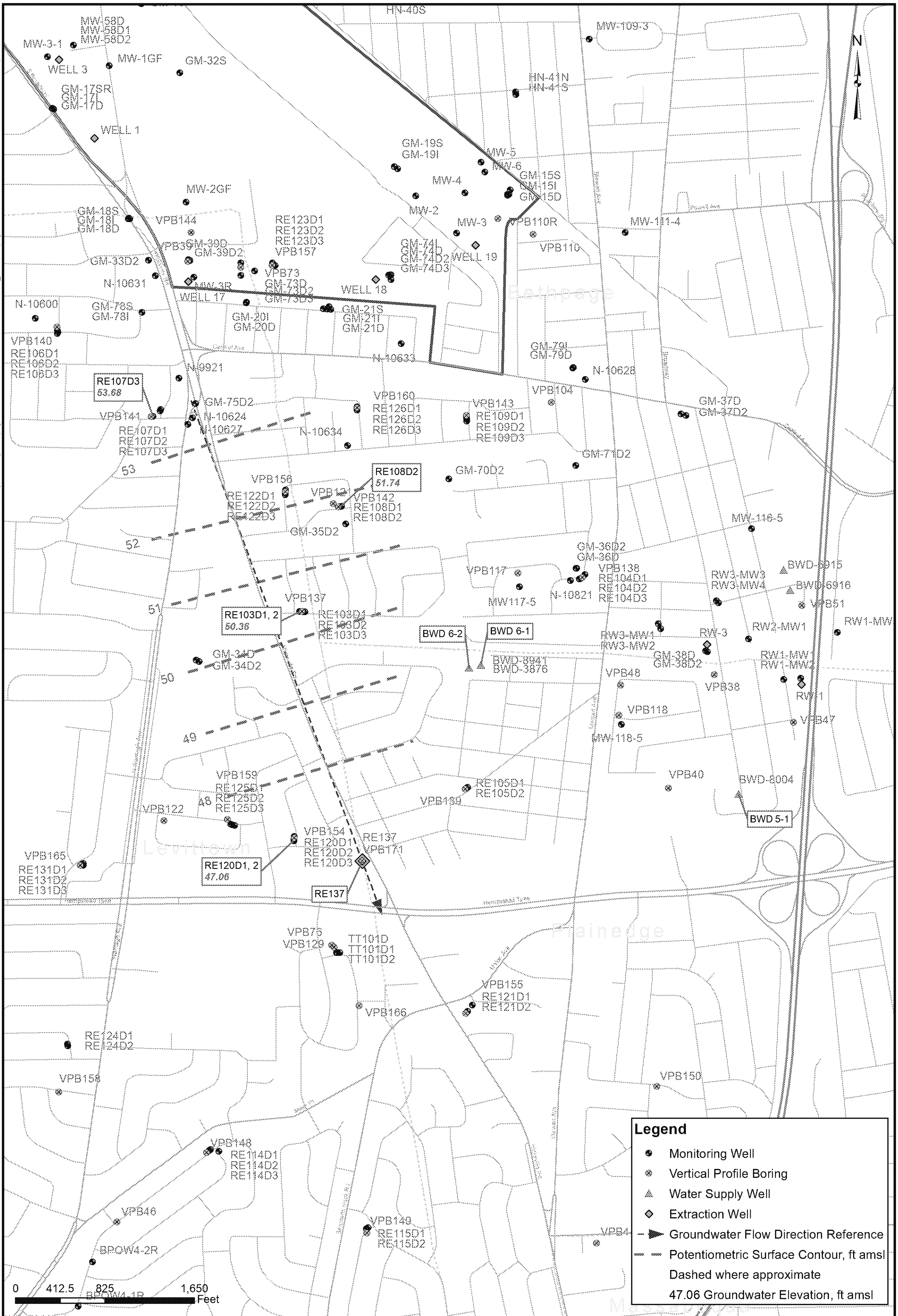
SHALLOW AQUIFER ZONE POTENTIOMETRIC SURFACE
3/10/17 AT 5:15 AM
BEFORE BWD WELL 6-2 PUMPING BEGAN
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 9/19/2017
APPROVED BY __	DATE __
FIGURE NO. 6-1	REV 0



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NAVFAC

INTERMEDIATE AQUIFER ZONE POTENTIOMETRIC SURFACE
3/10/17 AT 5:15 AM
BEFORE BWD WELL 6-2 PUMPING BEGAN
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 9/19/2017
APPROVED BY —	DATE —
FIGURE NO. 6-2	REV 0

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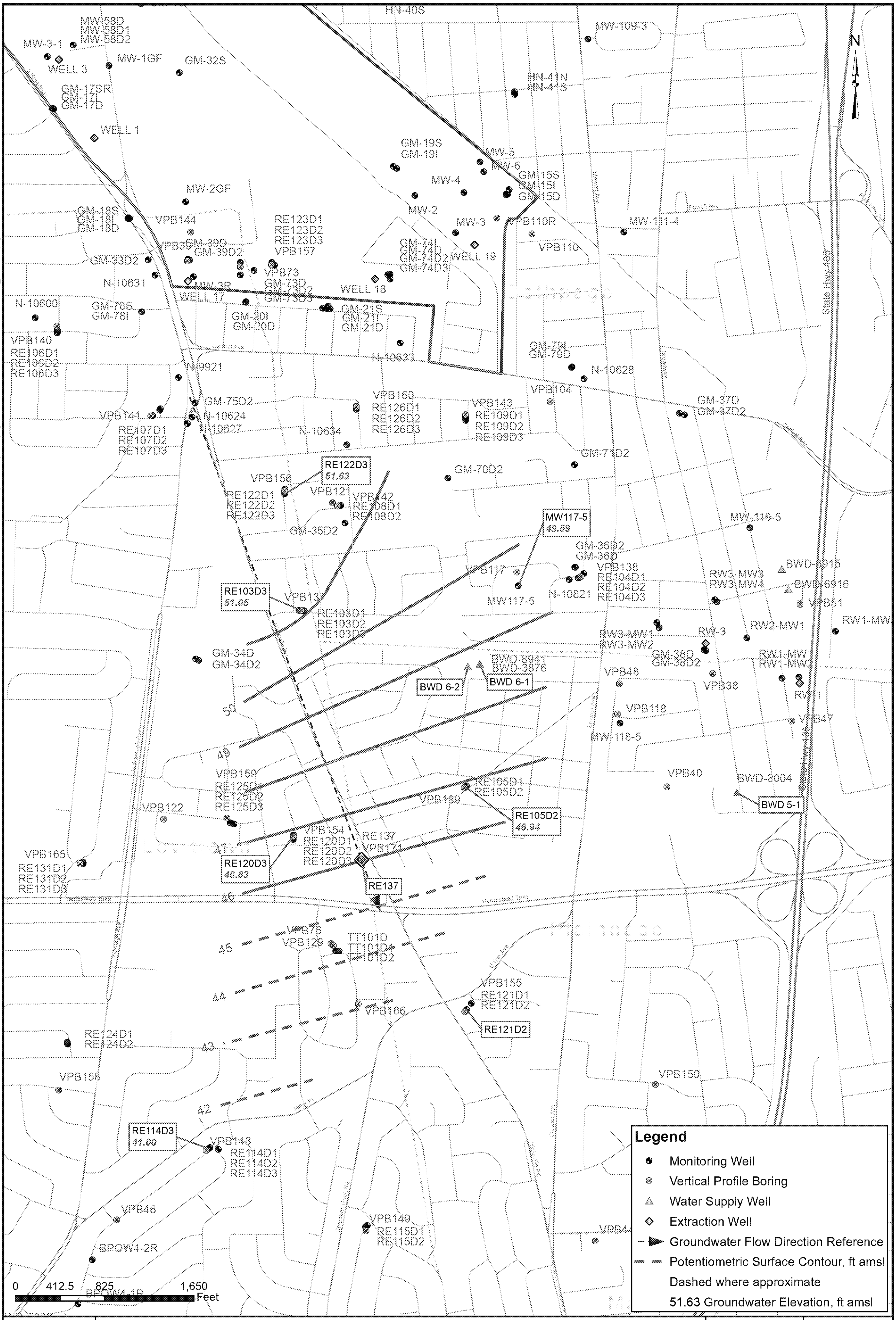
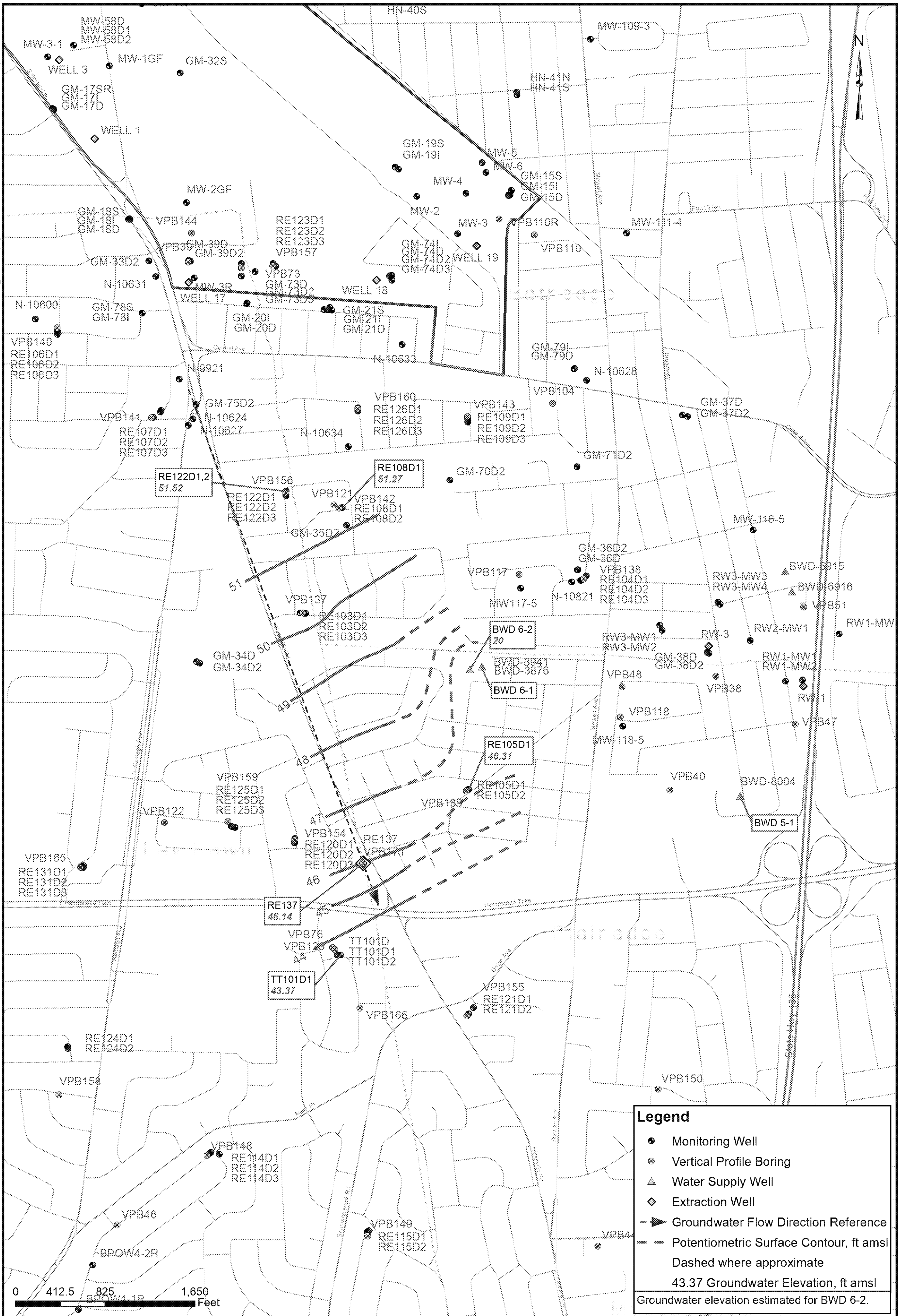


CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY	DATE
EV	9/19/2017
APPROVED BY	DATE
__	__
FIGURE NO. **6-3**	REV 0

NAVFAC

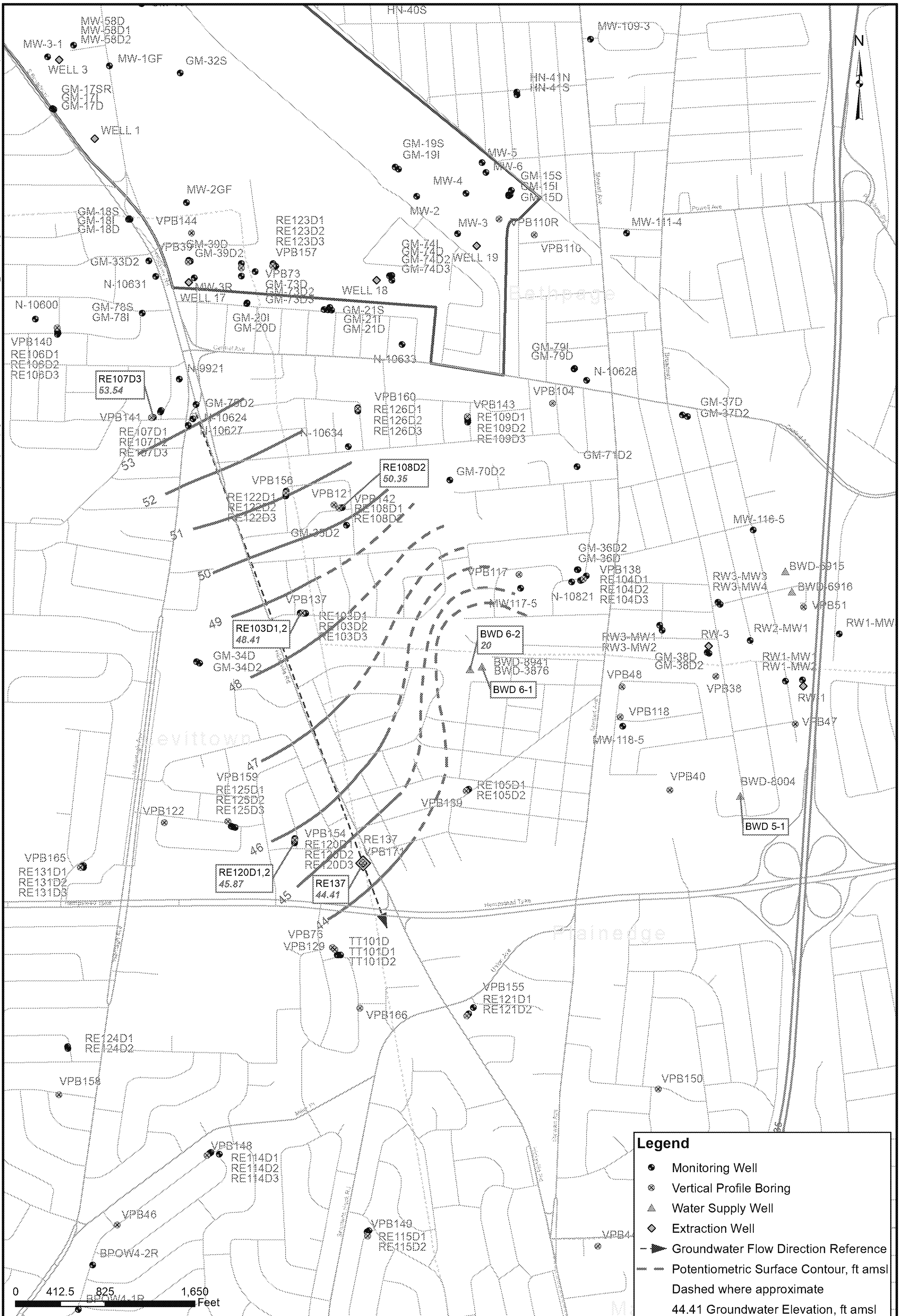
DEEP AQUIFER ZONE POTENTIOMETRIC SURFACE
3/10/17 AT 5:15 AM
BEFORE BWD WELL 6-2 PUMPING BEGAN
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT



NAVFAC

SHALLOW AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 8:07 AM
RE137 CONSTANT RATE PUMP TEST, T = 0 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 9/19/2017
APPROVED BY —	DATE —
FIGURE NO. 6-4	REV 0



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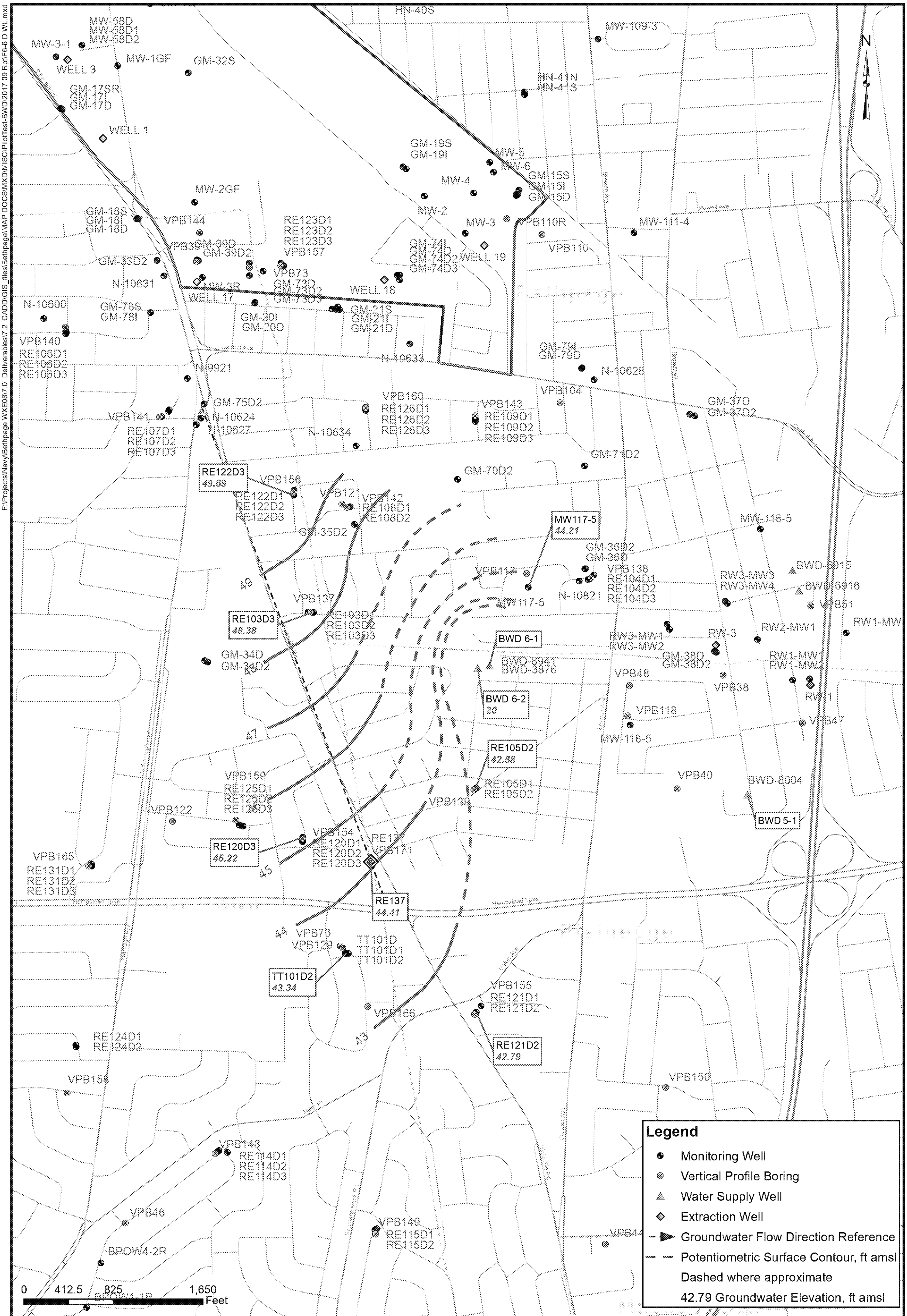
NAVFAC

INTERMEDIATE AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 8:07 AM
RE137 CONSTANT RATE PUMP TEST, T = 0 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

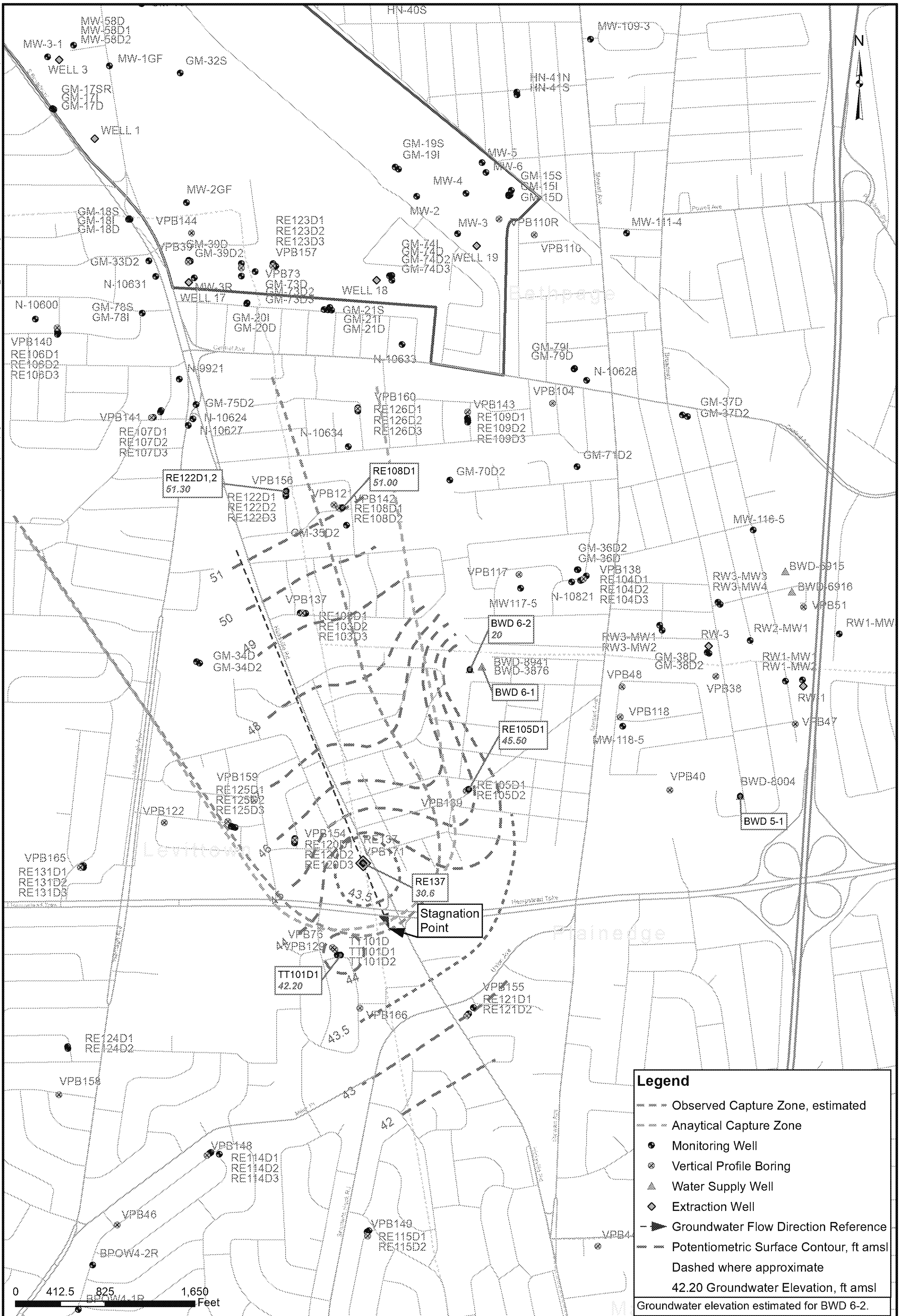
CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 9/19/2017
APPROVED BY __	DATE __
FIGURE NO. 6-5	REV 0



DEEP AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 8:07 AM
RE137 CONSTANT RATE PUMP TEST, T = 0 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

NAVFAC

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 9/19/2017
APPROVED BY	DATE
FIGURE NO. 6-6	REV 0



SHALLOW AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 4:00 PM
RE137 CONSTANT RATE PUMP TEST, T = 480 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

NAVFAC

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 10/5/2017
APPROVED BY —	DATE —
FIGURE NO. **6-7**	REV 0

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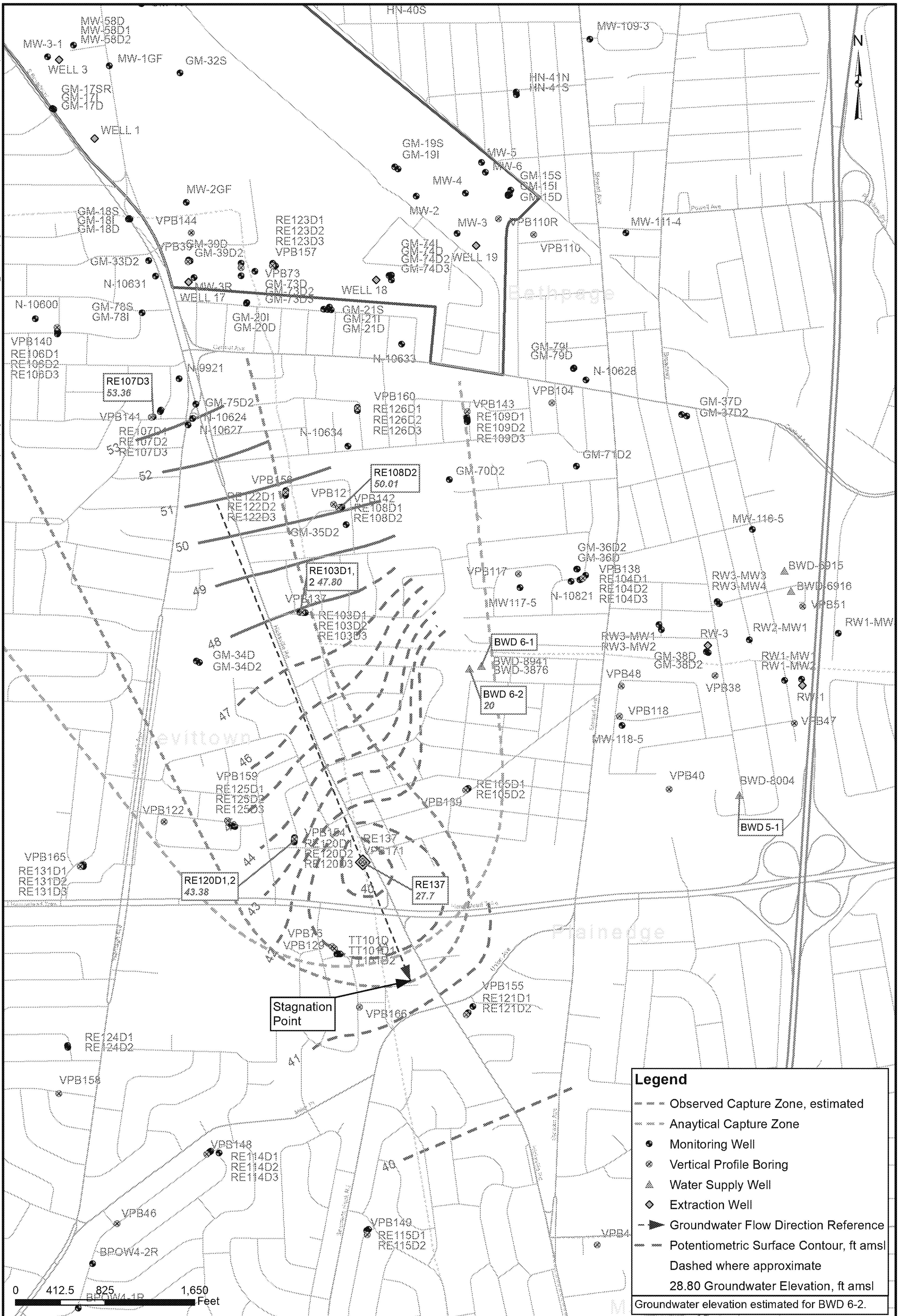

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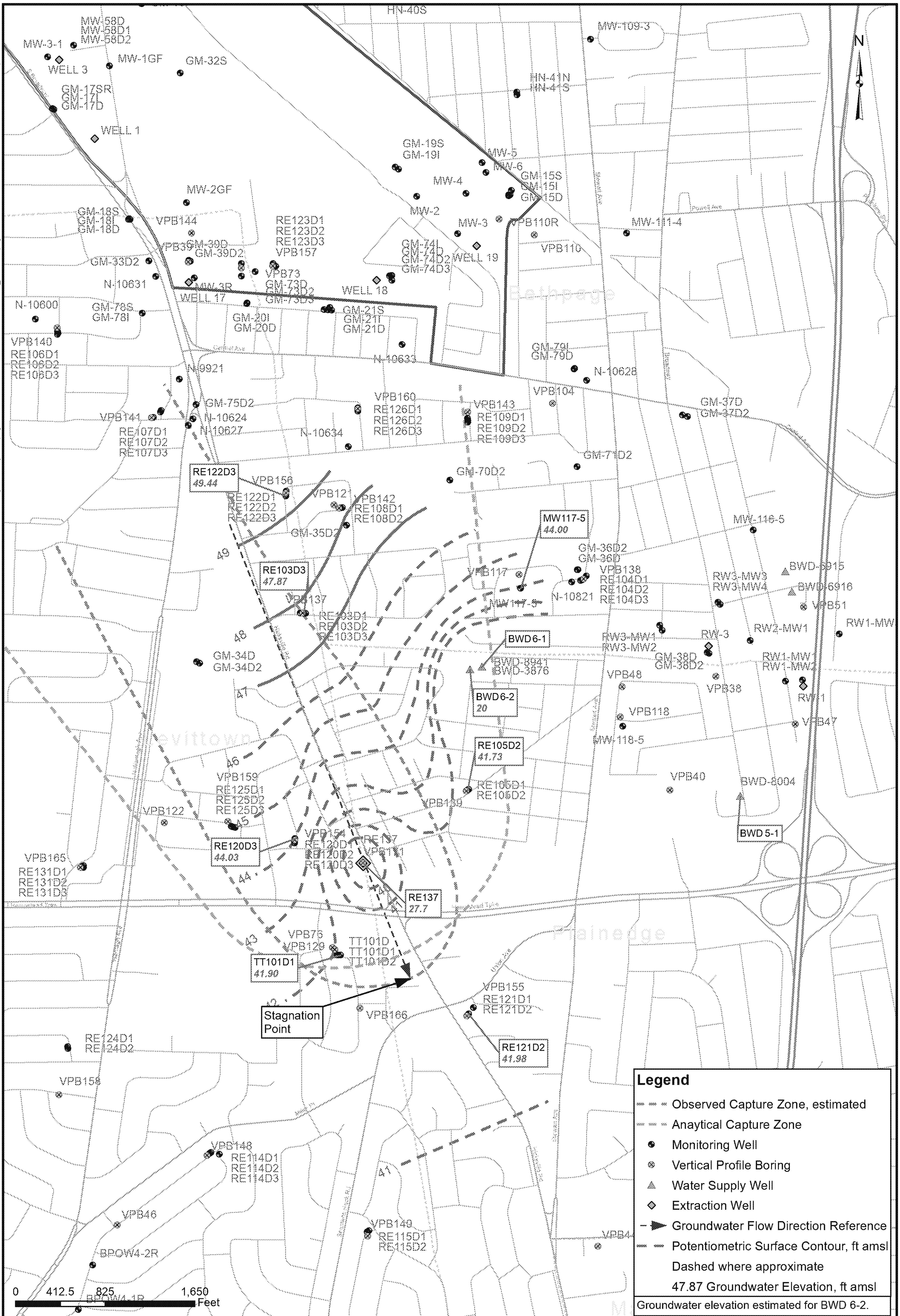
INTERMEDIATE AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 4:00 PM
RE137 CONSTANT RATE PUMP TEST, T = 480 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 10/5/2017
APPROVED BY __	DATE __
FIGURE NO. 6-8	REV 0



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DEEP AQUIFER ZONE POTENTIOMETRIC SURFACE
4/11/17 AT 4:00 PM
RE137 CONSTANT RATE PUMP TEST, T = 480 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 10/5/2017
APPROVED BY —	DATE —
FIGURE NO. 6-9	REV 0

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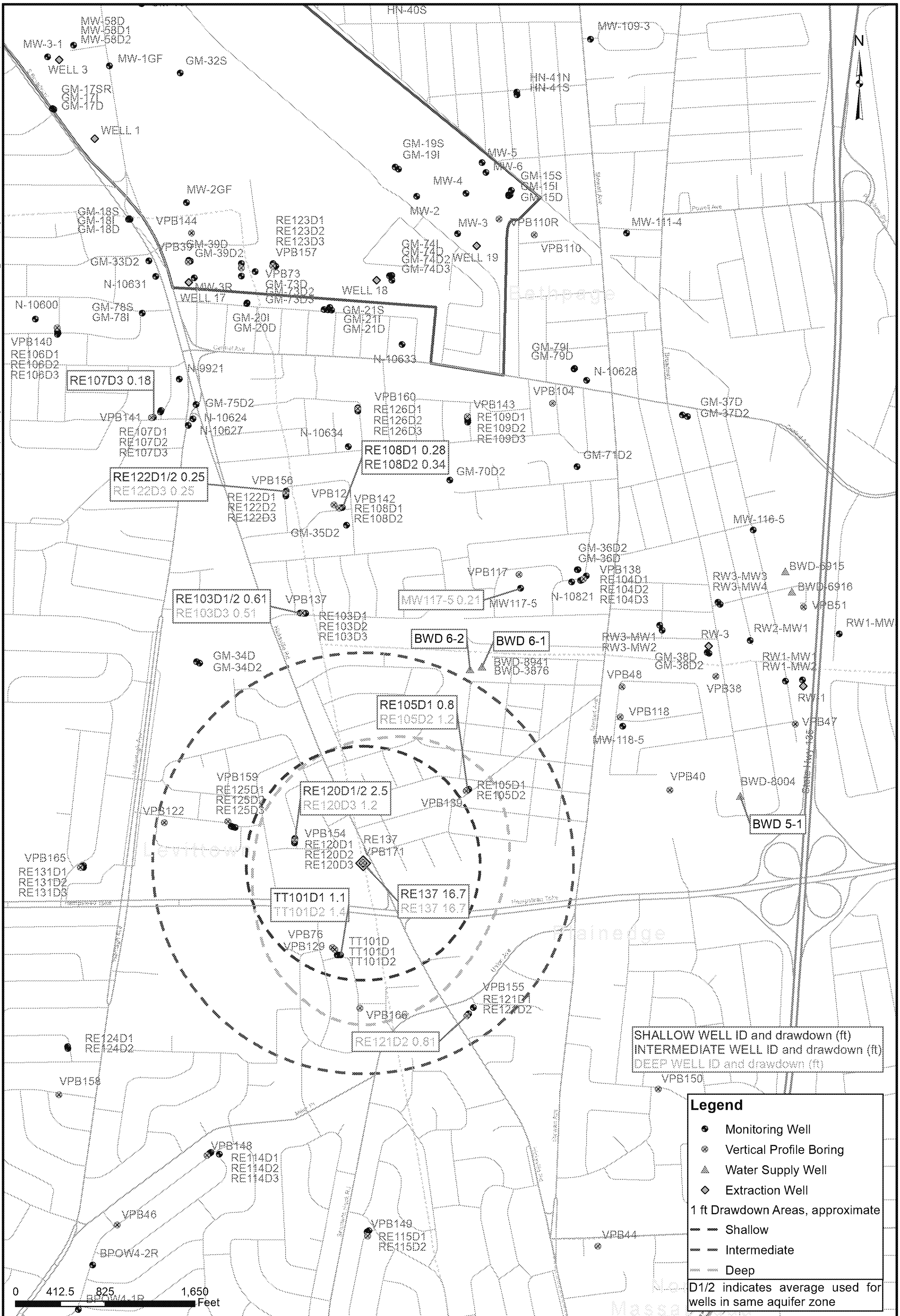

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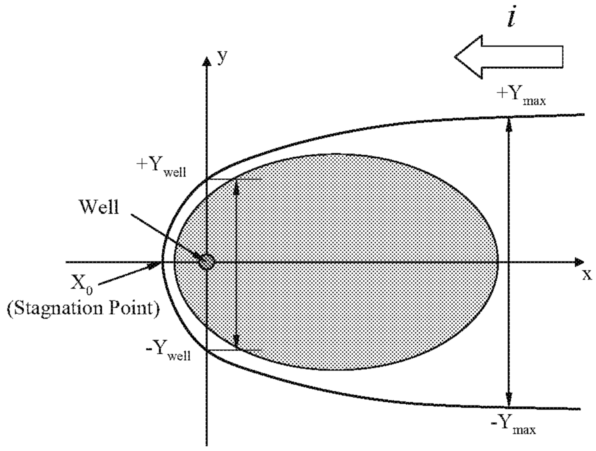
SHALLOW, INTERMEDIATE, AND DEEP AQUIFER ZONE DRAWDOWN
4/11/17 AT 4:00 PM
RE137 CONSTANT RATE PUMP TEST, T = 480 MINUTES
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 10/5/2017
APPROVED BY —	DATE —
FIGURE NO. 6-10	REV 0

Capture Zone Width Calculation, One Extraction Well

Assumptions:

- homogeneous, isotropic, confined aquifer of infinite extent
- uniform aquifer thickness
- fully penetrating extraction well(s)
- uniform regional horizontal hydraulic gradient
- steady-state flow
- negligible vertical gradient
- no net recharge, or net recharge is accounted for in regional hydraulic gradient
- no other sources of water introduced to aquifer due to extraction (e.g., from rivers or leakage from above or below)



$$x = \frac{-y}{\tan\left(\frac{2\pi Ti}{Q} y\right)} \quad - or - \quad y = \pm\left(\frac{Q}{2Ti}\right) - \left(\frac{Q}{2\pi Ti}\right)\tan^{-1}\left(\frac{y}{x}\right)$$

$$X_0 = -Q/2\pi Ti \quad ; \quad Y_{\max} = \pm Q/2Ti \quad ; \quad Y_{well} = \pm Q/4Ti$$

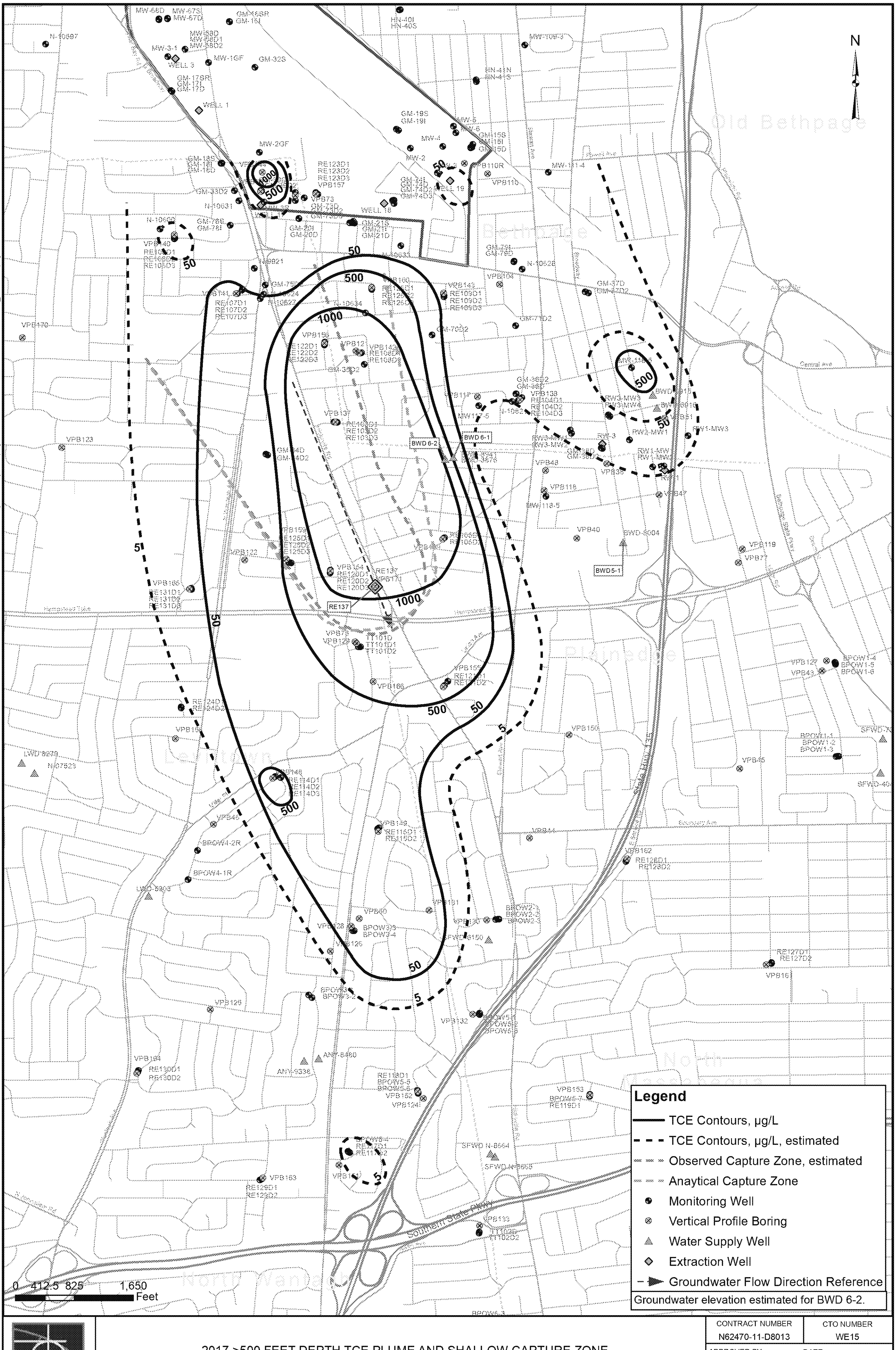
(must use consistent units, such as "ft" for distance and "day" for time)

Where:

Q	=	extraction rate
T	=	transmissivity, $K \cdot b$
K	=	hydraulic conductivity
b	=	saturated thickness
i	=	regional (i.e., pre-remedy-pumping) hydraulic gradient
X_0	=	distance from the well to the downgradient end of the capture zone along the central line of the flow direction
Y_{max}	=	maximum capture zone width from the central line of the plume
Y_{well}	=	capture zone width at the location of well from the central line of the plume

The above equation is used to calculate the outline of the capture zone. Solving the equation for $x = 0$ allows one to calculate the distance between the dividing streamlines at the line of wells ($2 \cdot Y_{well}$) and solving the equation for $x = \infty$ allows one to calculate the distance between the dividing streamlines far upstream from the wells ($2 \cdot Y_{max}$). One can also calculate the distance from the well to the stagnation point (X_0) that marks the downgradient end of the capture zone by solving for x at $y = 0$. For any value of y between 0 and Y_{max}, one can calculate the corresponding x value, allowing the outline of the capture zone to be calculated.

Figure 14. Capture zone width calculation, one extraction well.



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2017 >500 FEET DEPTH TCE PLUME AND SHALLOW CAPTURE ZONE
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY: EV	DATE: 9/19/2017
APPROVED BY: —	DATE: —
FIGURE NO. 6-12	REV 0

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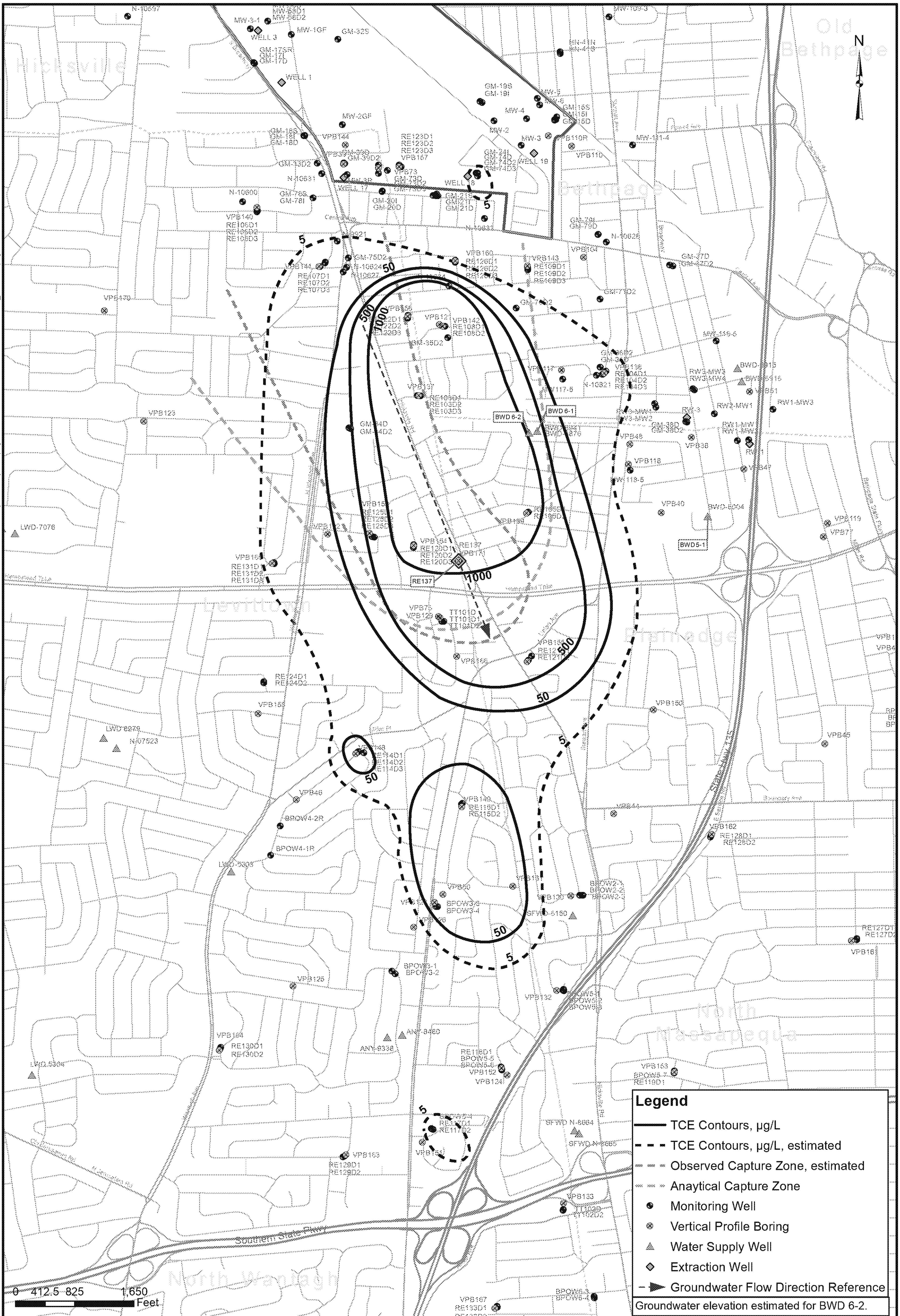
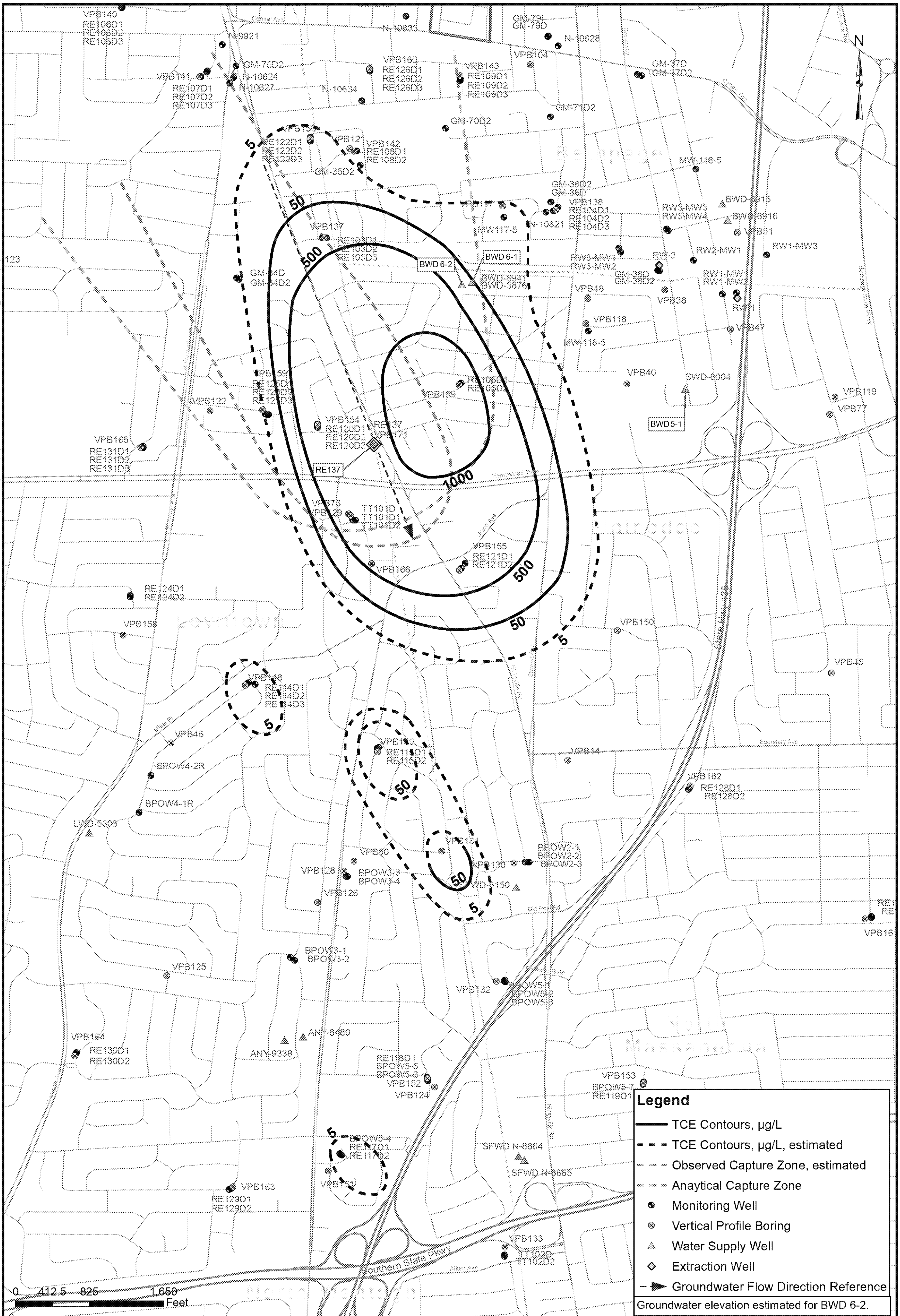


NAVFAC

2017 >600 FEET DEPTH TCE PLUME AND INTERMEDIATE CAPTURE ZONE
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

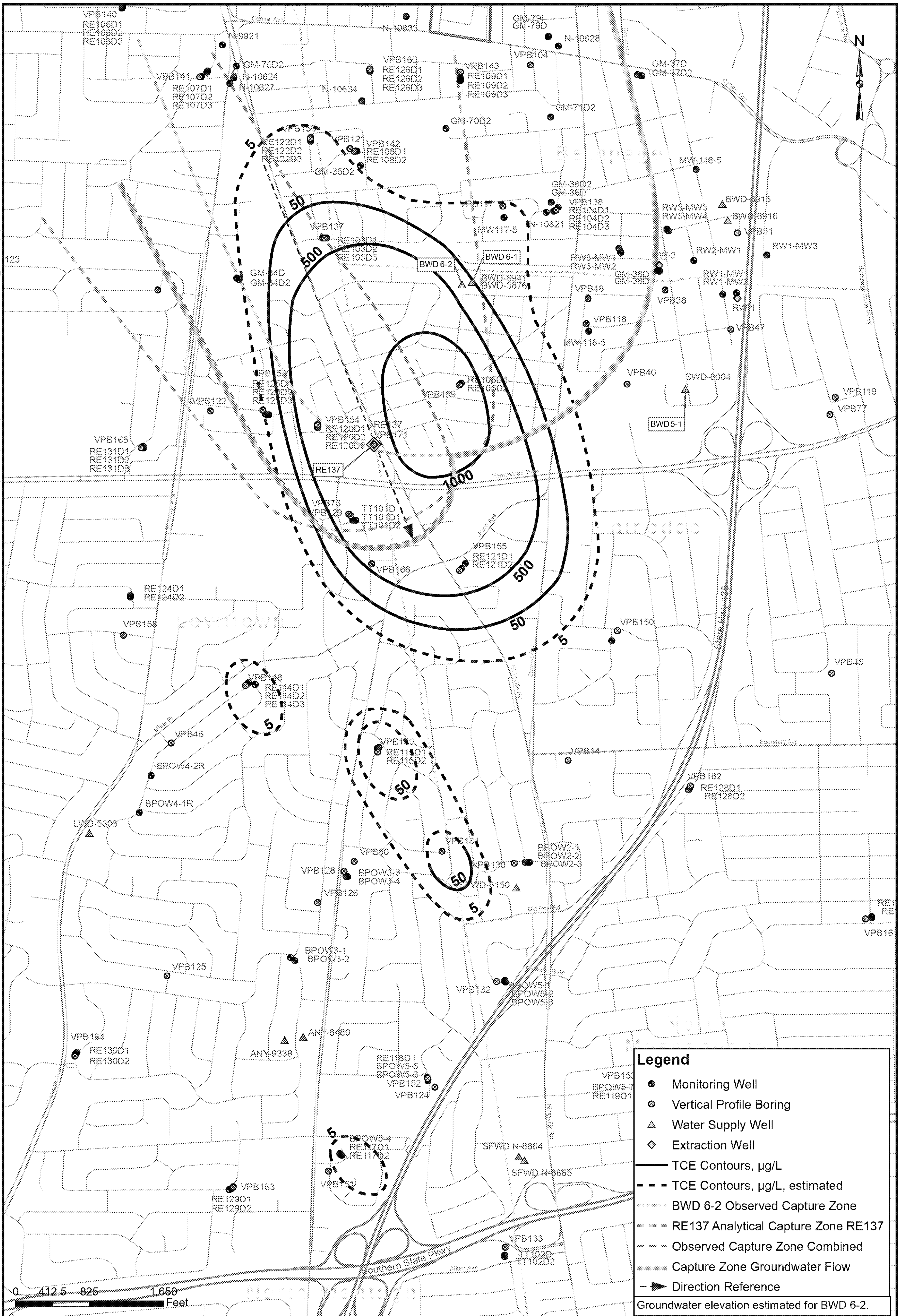
CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY: EV	DATE: 9/19/2017
APPROVED BY: —	DATE: —
FIGURE NO. 6-13	REV 0



2017 >700 FEET DEPTH TCE PLUME AND DEEP CAPTURE ZONE
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NAVFAC

CONTRACT NUMBER	N62470-11-D8013	CTO NUMBER	WE15
APPROVED BY	EV	DATE	10/5/2017
APPROVED BY	__	DATE	__
FIGURE NO.	6-14	REV	0



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2017 COMBINED CAPTURE ZONE NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NAVFAC

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY EV	DATE 3/5/2018
APPROVED BY	DATE
FIGURE NO. 6-15	REV 0

ATTACHMENTS

RESOLUTION CONSULTANTS

ATTACHMENT A

Cross Sections

RE137 Geologist Log

VPB171 Gamma Log

ESS Report

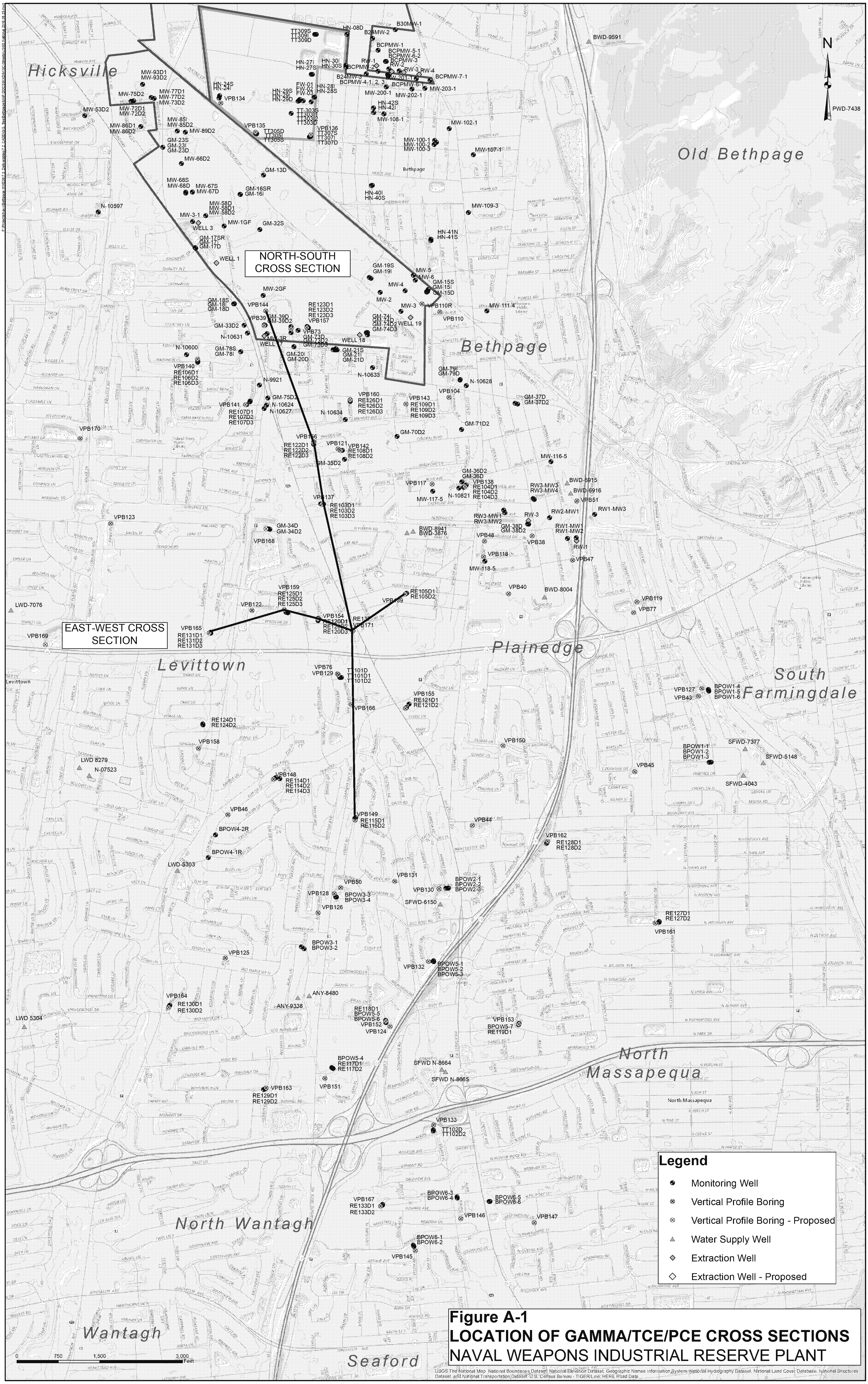

Figure A-1
LOCATION OF GAMMA/TCE/PCE CROSS SECTIONS
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

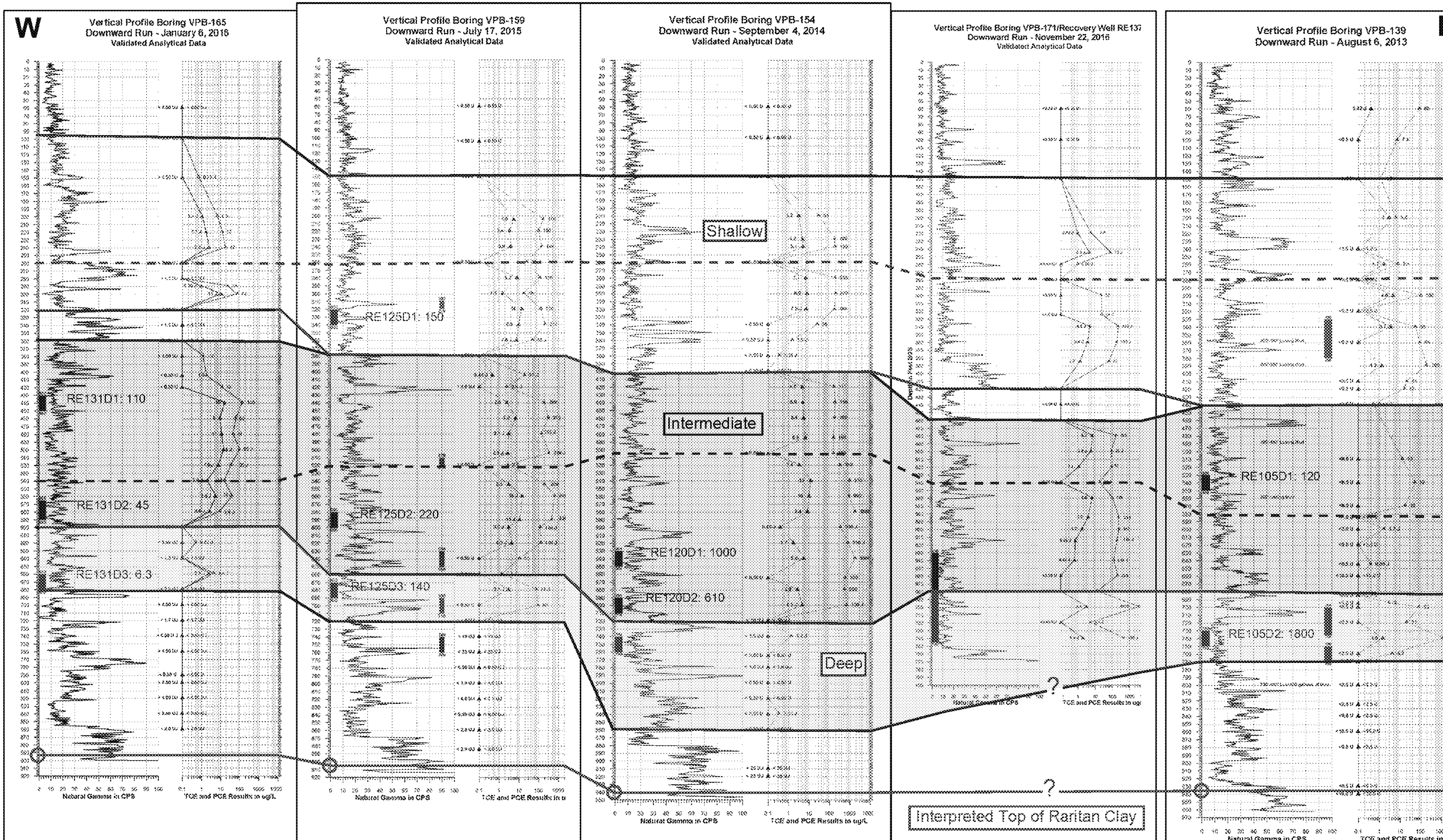

Figure A-2. WEST-EAST GAMMA/TCE/PCE CROSS SECTION

Notes:
Section not to scale.
Intended to illustrate relative mass based on TCE profile inflections.
Blue rectangles represent monitoring well screens. TCE posted at monitoring wells (blue) in ug/L from 1Q 2017 sampling round.
Purple rectangles represent screen intervals of nearby public water supply and monitoring wells.

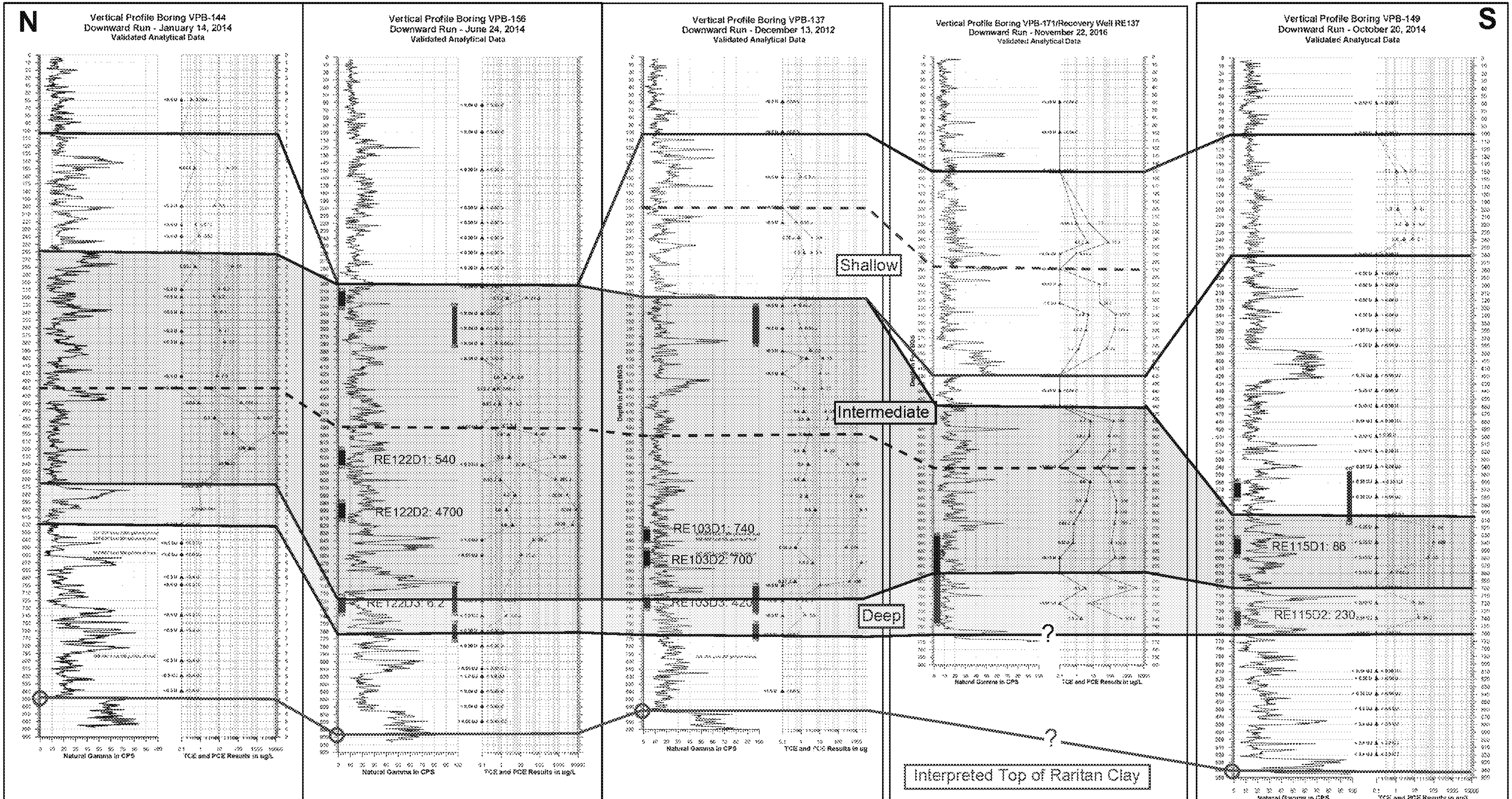

Figure A-3. NORTH-SOUTH GAMMA/TCE/PCE CROSS SECTION

Notes:
Section not to scale.
Intended to illustrate relative mass based on TCE profile inflections.
Blue rectangles represent monitoring well screens TCE posted at monitoring wells (blue) in ug/L from 1Q 2017 sampling round.
Purple rectangles represent screen intervals of nearby public water supply and monitoring wells.

Figure A-4 VPB171 Boring Log

Resolution Consultants

Boring Log

BORING #: VPB171

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Varricchio
Location: Hahn Ave & S. South Gate, Bethpage, NY	**Northing:** **Easting:**	**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (ft amsl):**	**Well Screen Interval (ft):** NA
Start Date: 10/21/2016	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):** NA
Finish Date: 11/29/2016		**Total Depth (ft):** 770.0

Mud Rotary Drilling Note: Unless denoted by a splitspoon sample (indicated by the presence of a PID reading), boundaries between strata are approximate and may be transitional because they are based on screened wash samples collected during mud rotary drilling at 5 ft. intervals.

DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
0				SW			Grass/Top Soil	
5				SW			Dark Yellowish brown (10 YR 4/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
10				SW			Dark Yellowish brown (10 YR 4/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
15				SW			Yellowish brown (10 YR 5/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
20				SW			Dark Yellowish brown (10 YR 4/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
25				SW			Yellowish brown (10 YR 5/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
30				SW			Dark Yellowish brown (10 YR 4/6) well graded fine to coarse SAND with some fine subrounded Gravel	
35				SW			Yellowish brown (10 YR 5/6) well graded fine to coarse SAND with little subrounded fine Gravel, Some Pyrite	
40				SW			Yellowish brown (10 YR 5/6) well graded fine to coarse SAND with little subrounded fine Gravel	
45				SP			Yellowish brown (10 YR 5/6) medium poorly graded SAND with few fine to coarse subrounded Gravel	
50				SP			Red (2 YR 5/8) well graded medium SAND, Trace red slity clay, few course gravel	
54				SP				

(Continued Next Page)

DEPTH (ft)	Gamma Ray 20 40 60 80	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
54–58							Red (2 YR 5/8) well graded medium SAND, Trace red slity clay, few course gravel *(continued)*	
58–63				SW-SM			Yellowish red (5YR 5/6) well graded medium to coarse SAND with some Silt and fine subrounded gravel	
63–68				SW			Yellowish Red (5YR 5/6) well graded fine to coarse SAND with fine to coarse subrounded Gravel	
68–73				SP			Red (2.5 YR 5/6)Well graded Course to medium SAND with trace fine - course subrounded Gravel	
73–78				SP			Yellowish Red (5 YR 5/6) poorly graded medium SAND with trace fine subrounded Gravel	
78–83				SP			Reddish yellow (5 YR 6/8) poorly graded medium SAND with fine subrounded Gravel, trace pyrite	
83–88				SW			Reddish yellow (7.5 YR 6/6) well graded fine to coarse SAND with trace lean Clay and subangular fine gravel, trace pyrite	
88–93				SW			Reddish Yellow (7.5 YR 6/6) Well graded fine to course SAND, with trace amounts of lean white clay and sub angular to angular fine gravel and pyrite	
93–98				SW			Reddish Yellow (7.5 YR 6/6) well graded Subangular SAND with some subangluar fine gravel and trace lean white sandy clay	
98–103				GW			Brownish Yellow(10 YR 6/6) well graded GRAVEL subrounded with medium to coarse Sand and trace lean white clay, trace red silt	
103–108				SW-GW			Yellowish brown (10 YR 6/6) gravelly well graded medium to coarse subangular SAND, with trace white lean clay and red silt	
108–113				SW-GW			Yellowish brown (10 YR 6/6) gravelly well graded medium to coarse subangular SAND, with trace white lean clay and red silt	
113–				GP			Light yellowish brown (10 YR 6/4) poorly graded fine subangular GRAVEL	

Depth scale: 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114

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DEPTH (ft)	Gamma Ray 20 40 60 80	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
116				GW			Light yellowish brown (10 YR 6/4) poorly graded fine subangular GRAVEL *(continued)*	
118							Light yellowish brown (10 YR 6/4) well graded GRAVEL subrounded, trace medium to coarse subangular Sand	
123				SW			Yellow (10 YR 7/6) well graded fine to coarse subanguar SAND with trace iron nodules	
128				CH			Grayish brown (10YR 5/2) fat CLAY, trace fine Sand	
133				SP			Light yellowish brown (10 YR 6/4) poorly graded fine SAND, few fat Clay and iron nodules	
138				SP			Light yellowish brown (10 YR 6/4) poorly graded fine SAND, few fat Clay	
143				SP			Grayish brown (10 YR 5/2) poorly graded fine to medium subangular SAND	
148				CL			Light yellowish gray (10 YR 6/2) fine Sandy lean CLAY	
153				SP			Pale brown (10 YR 6/3) poorly graded fine SAND, trace Silt and iron nodules	
158				SP			Grayish brown (10 YR 5/2) poorly graded fine SAND, trace lean Clay and iron nodules	
163				SP			Pale brown (10 YR 6/3) poorly graded fine to medium subrounded SAND, with few iron nodules	
168				SM			Pale brown (10 YR 6/3) Silty fine SAND	
173				CH			Pale brown (10 YR 6/3) fine Sandy fat CLAY, few iron nodules	

Depth scale: 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176

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DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
178				SP			Brown (10 YR 5/3) poorly graded medium subangular SAND, trace poorly graded fine subangular Gravel	
184				SP			Brown (10 YR 5/3) poorly graded fine SAND, trace Mica flakes	
188				ML			Gray (10 YR 5/1) SILT, trace Mica flakes	
194				CL-ML			Very dark gray (10 YR 3/1) Silt mixed with lean CLAY	
198				ML			Brown (10 YR 5/3) fine Sandy SILT	
204				CL			Brownish yellow (10 YR 6/6) lean CLAY, trace fine Sand	
208				CL-ML			Dark gray (10 YR 4/1) Silt mixed with lean CLAY, trace lignite	
214				SW			Brown (10 YR 4/3) well graded fine to coarse subangular SAND, trace iron nodules and lignite	
218				CL			Dark gray (10 YR 4/1) lean CLAY, some poorly graded medium Sand, trace iron nodules	
224				CL			Dark gray (10 YR 4/1) lean CLAY, trace poorly graded medium Sand and iron nodules	
228				ML-CL			Grayish brown (10 YR 5/2) Clayey SILT, few fine to medium subangular sand, trace iron nodules and lignite	
234				ML-CL			Grayish brown (10 YR 5/2) Clayey SILT, few fine to medium subangular sand, trace iron nodules and lignite	
238				CL-ML				

Depth scale: 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238

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DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
240–244				CL			Yellowish brown (10 YR 5/4) Clayey SILT, some medium subangular sand, trace iron nodules *(continued)*	
244–248				CL-ML			Yellowish brown (10 YR 5/8) fine Sandy lean CLAY, some iron nodules	
248–254				CH			Yellowish brown (10 YR 5/8) lean CLAY, few fine Sand and iron nodules	
254–258				CH			Black (10 YR 2/1) fat CLAY, trace lignite	
258–264				CH			Black (10 YR 2/1) fat CLAY, few lignite	
264–268				CH			Black (10 YR 2/1) fat CLAY, few lignite	
268–274				CH			Black (10 YR 2/1) fat CLAY, little lignite	
274–278				CH			Black (10 YR 2/1) fat CLAY, few poorly graded fine Sand and lignite	
278–284				CH			Very dark gray (10 YR 3/1) fat CLAY, trace lignite	
284–288				CH			Black (10 YR 2/1) fat CLAY, some poorly graded fine Sand and lignite	
288–294				CH			Black (10 YR 2/1) fat CLAY, some poorly graded fine Sand and lignite	
294–298				SP			Black (10 YR 2/1) fat CLAY, some poorly graded fine Sand and lignite	
298–300							Yellowish brown (10 YR 5/4) poorly graded fine SAND, trace lignite	

Depth scale: 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300

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DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
302				SP			Yellowish brown (10 YR 5/4) poorly graded fine SAND, trace lignite *(continued)*	
304							Yellowish brown (10 YR 5/4) poorly graded fine SAND	
308				SP			Yellowish brown (10 YR 5/4) poorly graded fine SAND	
313				SP			Yellowish brown (10 YR 5/4) poorly graded fine SAND, trace Silt	
318				SP			Yellowish brown (10 YR 5/4) poorly graded fine SAND, trace Silt, iron nodules and lignite	
323				ML			Grayish brown (10 YR 5/2) fine Sandy SILT, few lignite and iron nodules, trace lean clay	
328				SM			Grayish brown (10 YR 5/2) Silty fine poorly graded SAND, little lignite and iron nodules	
333				SM			Grayish brown (10 YR 5/2) Silty fine poorly graded SAND, little lignite and iron nodules	
338				SP			Brown (10 YR 5/3) poorly graded fine SAND, few lignite and iron nodules	
343				SP			Brown (10 YR 5/3) poorly graded fine SAND, few lignite and iron nodules	
348				CL			Dark gray (10 YR 4/1) lean CLAY, with little medium Sand, few lignite and iron nodules	
353				CL			Dark gray (10 YR 4/1) lean CLAY, with little medium Sand, few lignite and iron nodules	
358				CL			Grayish brown (10 YR 5/2) fine Sandy lean CLAY	

Depth scale: 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362

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DEPTH (ft)	USCS	MATERIAL DESCRIPTION
364	CL	Grayish brown (10 YR 5/2) fine Sandy lean CLAY
368	CL	Grayish brown (10 YR 5/2) lean CLAY, trace fine Sand
372	CH	Very dark gray (10 YR 3/1) fat CLAY, trace lignite and iron nodules
376	CL	Grayish brown (10 YR 5/2) fine to medium Sandy fat CLAY, little lignite and iron nodules
380	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt
384	CH-ML	Very dark gray (10 YR 4/1) fat CLAY with lamination and Light gray (10YR 7/1) poorly graded fine Sandy SILT
388	CH-ML	Very dark gray (10 YR 4/1) fat CLAY with lamination and Light gray (10YR 7/1) poorly graded fine Sandy SILT
392	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt
396	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt
400	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt
404	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt and poorly graded fine sand
408	CH	Very dark gray (10 YR 3/1) fat CLAY, trace Silt and poorly graded fine sand
412	SM	Dark gray (10 YR 4/1) poorly graded fine Sandy SILT

Column headings: DEPTH (ft) | Gamma Ray (20 40 60 80) | PID (ppm) | Hydropunch Samples (ppm) | USCS | Formation | GRAPHIC LOG | MATERIAL DESCRIPTION | Well Completion

Depth scale: 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424

(Continued Next Page)

DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
426–428							Dark gray (10 YR 4/1) poorly graded fine Sandy SILT *(continued)*	
428–433				SM			Dark gray (10 YR 4/1) poorly graded fine Sandy SILT, trace lean clay	
433–438				CL			Dark gray (10 YR 4/1) poorly graded fine Sandy lean CLAY	
438–443				SC			Dark gray (10 YR 4/1) lean Clayey poorly graded fine SAND, trace lignite and iron nodules	
443–448				SC			Dark gray (10 YR 4/1) lean Clayey poorly graded fine SAND, few lignite and iron nodules	
448–453				SC			Dark gray (10 YR 4/1) lean Clayey poorly graded fine SAND, few lignite and iron nodules	
453–458				CL			Dark gray (10 YR 4/1) poorly graded fine Sandy lean CLAY	
458–463				SC			Dark grayish brown (10 YR 4/2) lean Clayey poorly graded fine SAND, few lignite and iron nodules	
463–468				CL			Gray (10 YR 5/1) poorly graded fine Sandy lean CLAY, few lignite	
468–473				CL			Gray (10 YR 5/1) poorly graded fine Sandy lean CLAY, few lignite	
473–478				SC			Light gray (10 YR 7/1) lean Clayey poorly graded fine SAND, trace lignite and iron nodules	
478–483				SC			Light brownish gray (10 YR 6/2) Clayey well graded fine to medium SAND, trace iron nodules	
483–486				SW			Brownish yellow (10 YR 6/6) well graded fine to medium SAND, trace lignite	

Depth marks: 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486

(Continued Next Page)

DEPTH (ft)	USCS	MATERIAL DESCRIPTION
486		Brownish yellow (10 YR 6/6) well graded fine to medium SAND, trace lignite *(continued)*
488	CL	Gray (10 YR 5/1) lean CLAY, some well graded fine to coarse subrounded SAND
493	SW	Gray (10 YR 5/1) well graded fine to coarse subrounded SAND, few lean Clay
498	SC	Grayish brown (10 YR 5/2) clayey well graded fine to medium subrounded SAND, trace lignite
503	CL	Gray (10 YR 5/1) lean CLAY, little poorly graded fine Sand, trace lignite
508	SC	Grayish brown (10 YR 5/2) Clayey well graded fine to medium subrounded SAND, trace lignite
513	SC	Grayish brown (10 YR 5/2) Clayey well graded fine to medium subrounded SAND, trace lignite
518	SM	Gray (10 YR 5/1) Silty poorly graded fine SAND, trace lean clay
523	ML-CL	Black (10 YR 2/1) Silt mixed with lean Clay, trace poorly graded fine sand
528	ML-CL	Black (10 YR 2/1) Silt mixed with lean Clay, little poorly graded fine sand
533	SC	Black (10 YR 2/1) Clayey well graded fine to medium subangular SAND
538	SP	Yellow (10 YR 7/6) poorly grade fine SAND, trace lignite
543	SP	Yellow (10 YR 7/6) poorly grade fine SAND

Column headings: DEPTH (ft); Gamma Ray (20 40 60 80); PID (ppm); Hydropunch Samples (ppm); USCS; Formation; GRAPHIC LOG; MATERIAL DESCRIPTION; Well Completion

Depth scale: 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546

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DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
548				SW			Light brownish gray (10 YR 6/2) well graded fine to coarse subrounded SAND, trace Silt	
553				SW			Light brownish gray (10 YR 6/2) well graded fine to medium SAND	
558				SW-SC			Brown (10 YR 5/3) well graded fine to medium subrounded SAND, little Clay	
563				SW			Light gray (10 YR 7/2) well graded fine to coarse subrounded SAND, trace Clay	
568				SW			Light gray (10 YR 7/2) well graded fine to coarse subrounded SAND	
573				SP			Grayish brown (10 YR 5/2) poorly graded medium subrounded SAND	
578				SP			Grayish brown (10 YR 5/2) poorly graded medium subrounded SAND	
583				SM			Grayish brown (10 YR 5/2) poorly graded medium subrounded SAND, some Silt	
588				SW			Light gray (10 YR 7/2) well graded medium subangular SAND, few Silt	
593				SW			Light gray (10 YR 7/2) well graded fine to coarse subangular SAND, trace Silt	
598				SC			Very dark gray (10 YR 7/2) well graded fine to medium subangular SAND, some Clay	
603				SC			Gray (10 YR 6/1) well graded fine to medium subangular SAND, little Clay	
608				SW				

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DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
610–613							Dark gray (10 YR 4/1) well graded fine to medium SAND, trace fine subangular Gravel *(continued)*	
613–618				CL			Dark gray (10 YR 4/1) lean CLAY, trace poorly grade fine SAND and lignite	
618–623				CL			Dark gray (10 YR 4/1) lean CLAY, trace poorly grade fine SAND and lignite	
623–628				SP			Light grayish brown (10 YR 6/2) poorly graded fine SAND	
628–633				SP			Light grayish brown (10 YR 6/2) poorly graded fine SAND	
633–638				SW			Gray (10 YR 5/1) well graded fine to coarse subangular SAND, trace fine subangular Gravel	
638–643				SW			Very pale brown (10 YR 7/3) well graded fine to coarse subangular SAND, trace lean Clay	
643–648				CL			Dark gray (10 YR 4/1) lean CLAY, few poorly graded fine Sand	
648–653				SW			Gray (10 YR 6/1) well graded fine to coarse subagnular SAND, trace lean Clay	
653–658				SW			Gray (10 YR 6/1) well graded fine to coarse subagnular SAND, trace lean Clay	
658–663				SW			Gray (10 YR 6/1) well graded fine to coarse subangular SAND, trace lean Clay	
663–668				SC			Light brownish gray (10 YR 6/2) Clayey poorly graded fine SAND	
668–671				SC			Light brownish gray (10 YR 6/2) Clayey poorly graded fine SAND	

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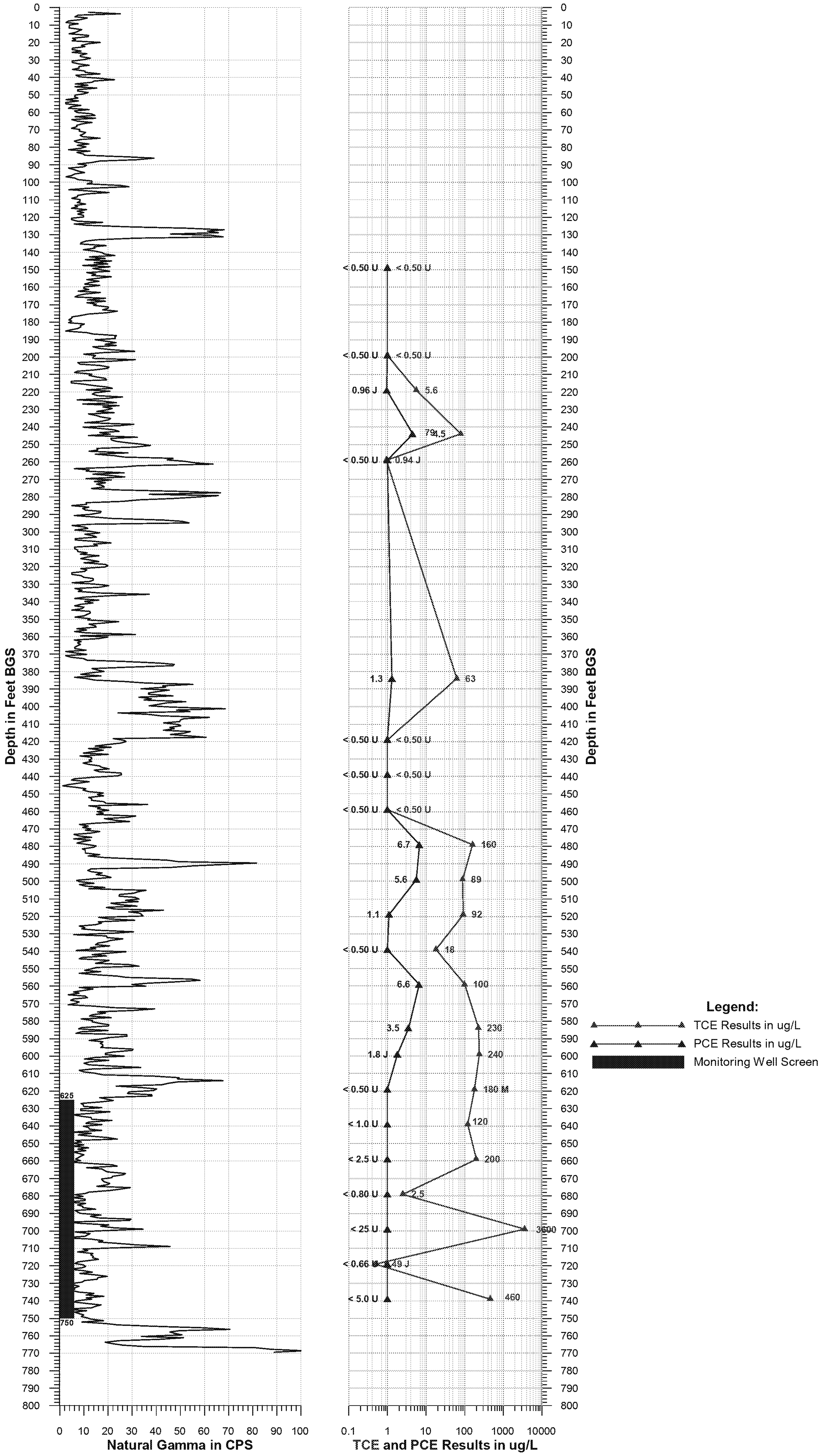
DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
672				SC			Light brownish gray (10 YR 6/2) Clayey poorly graded fine SAND *(continued)*	
674				SC			Light brownish gray (10 YR 6/2) Clayey poorly graded fine SAND	
678				GP			White (10 YR 8/1) poorly graded fine angular GRAVEL, trace well graded medium to coarse angular Sand	
684				GP			White (10 YR 8/1) poorly graded fine angular GRAVEL, few well graded medium to coarse angular Sand	
688				SW			Very pale brown (10 YR 7/4) well graded medium to coarse angular SAND, some poorly graded fine angular Gravel	
694				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some poorly graded fine subangular Gravel	
698				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some poorly graded fine subangular Gravel	
704				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some poorly graded fine subangular Gravel, trace lean clay	
708				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular Sand, some poorly graded fine subangular GRAVEL, trace lean clay	
714				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some well graded fine to coarse subangular Gravel	
718				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some poorly graded fine subangular Gravel	
724				SW			Very pale brown (10 YR 7/4) well graded medium to coarse subangular SAND, some poorly graded fine angular Gravel, trace lean clay	
728				SW			Very pale brown (10 YR 7/4) well graded medium to coarse angular SAND, some well graded fine to coarse angular Gravel, trace lean clay	

Depth scale: 672, 674, 676, 678, 680, 682, 684, 686, 688, 690, 692, 694, 696, 698, 700, 702, 704, 706, 708, 710, 712, 714, 716, 718, 720, 722, 724, 726, 728, 730, 732

(Continued Next Page)

DEPTH (ft)	Gamma Ray (20 40 60 80)	PID (ppm)	Hydropunch Samples (ppm)	USCS	Formation	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion
734				SW			Very pale brown (10 YR 7/4) well graded medium to coarse angular SAND, some well graded fine to coarse angular Gravel	
736								
738				SC			Light gray (10 YR 7/1) well graded fine to medium subangular Sand, some fat Clay	
740								
742								
744				SC			Light gray (10 YR 7/1) well graded fine to medium subangular Sand, some fat Clay	
746								
748				SP			Very pale brown (10 YR 7/4) poorly graded fine SAND, trace poorly graded fine subangular Gravel	
750								
752								
754				CL			Gray (10 YR 6/1) lean CLAY, little poorly graded fine Sand	
756								
758				CL			Gray (10 YR 6/1) lean CLAY, little poorly graded fine Sand	
760								
762								
764				CL			Gray (10 YR 6/1) lean CLAY, little poorly graded fine Sand	
766								
768								
770								
							End of boring at 770.0 ft. bgs.	

Figure A-5
Vertical Profile Boring VPB-171/Recovery Well RE137
Downward Run - November 22, 2016



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ATTACHMENT B

Pumping Well Records

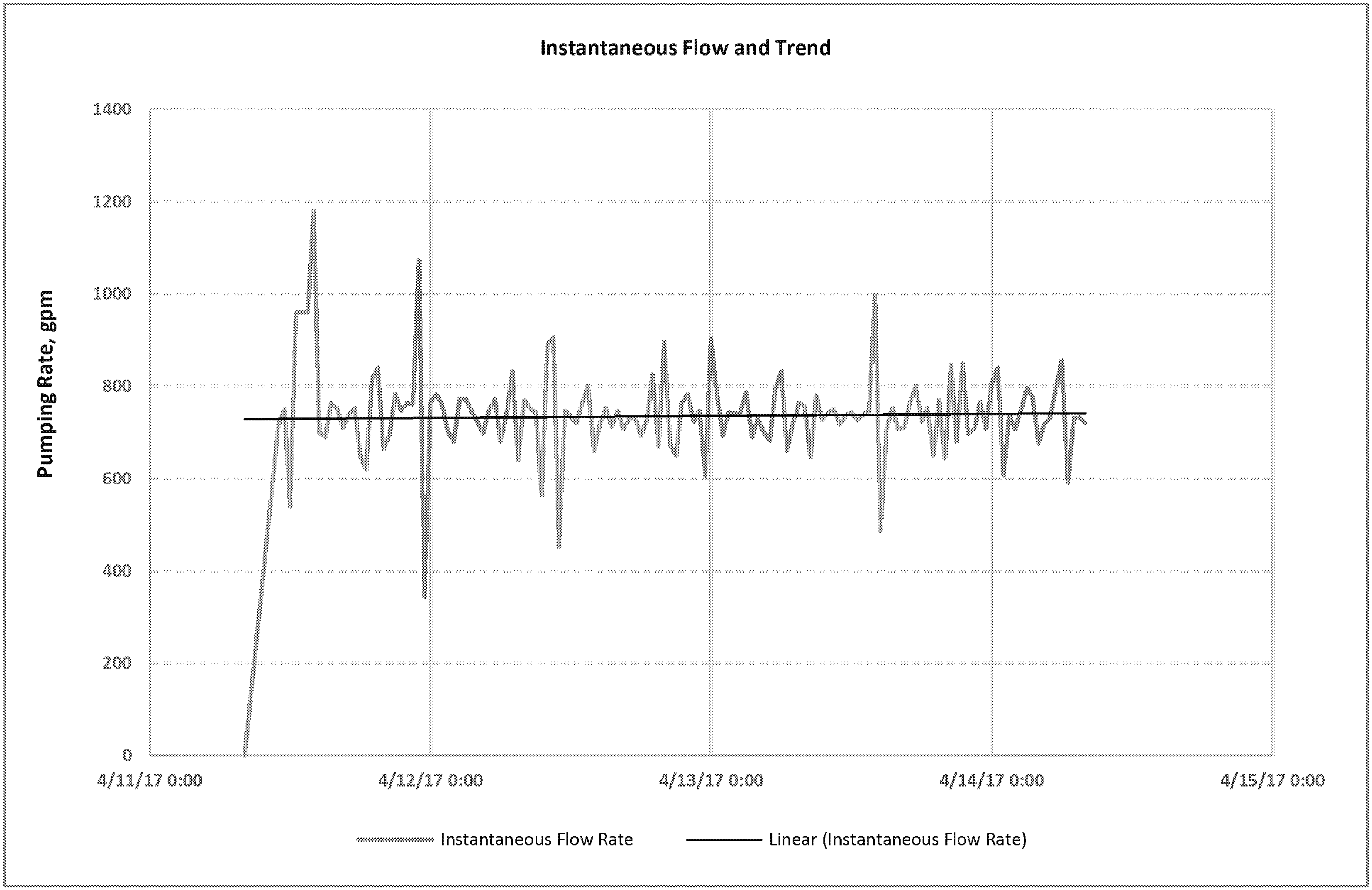
Table B-1. Summary of Bethpage Water District Pumping Information
NWIRP, Bethpage, NY

Date	Pumping Duration		
	BWD 6-1*	BWD 6-2*	BWD 5-1*
4/5/2017	9:20 am - 11:45 am	24/7	7 am - 9 am
4/6/2017	9:50 am - 1:00 pm	24/7	7 am - 9 am
4/7/2017	10:00 am - 2:00 pm	24/7	7 am - 9 am
4/8/2017	off	24/7	7 am - 10 am
4/9/2017	off	24/7	7 am - 9 am
4/10/2017	8:45 am - 12:00 pm	24/7	7 am - 9 am
4/11/2017	8:45 am - 12:30 pm	24/7	7 am - 9 am
4/12/2017	off	24/7	7 am - 9 am
4/13/2017	8:30 am - 1:30 pm	24/7	7 am - 9 am
4/14/2017	na	24/7	6 am - 9 am
4/15/2017	na	24/7	6 am - 9 am

***Pumping Notes:**

BWD 6-1 typically ran at 1,200 gallons per minute (gpm)
BWD 6-2 typically ran at 1,100 to 1,200 gpm
BWD 6-2 pumped 24/7 approximately 3/19/2017 through 4/17/2017
BWD 5-1 typically ran at 1,200 gpm (assumed)
24/7 - pumped 24 hours per day, 7 days per week
na - times not available

Figure B-1. RE137 Pumping Rate for Constant Rate Test
NWIRP, Bethpage, NY



RESOLUTION
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ATTACHMENT C

Well Hydrographs

Table C-1. Observation Well Response to BWD 6-2 Pumping
NWIRP Bethpage, NY

Well ID	Aquifer Zone	Distance from BWD 6-2 (ft)	Drawdown on 3/10/17 (ft)
RE105D1	Shallow	1101	2.0
RE108D1	Shallow	1897	1.4
RE122D2	Shallow	2340	1.5
RE122D1	Shallow	2359	1.1
RE103D2	Intermediate	1599	2.6
RE103D1	Intermediate	1646	2.5
RE108D2	Intermediate	1906	1.8
RE120D1	Intermediate	2260	1.8
RE120D2	Intermediate	2270	1.9
RE107D3	Intermediate	3725	0.6
RE114D1	Intermediate	5044	0.9
MW117-5	Deep	884	5.7
RE105D2	Deep	1110	4.6
RE103D3	Deep	1614	3.2
RE120D3	Deep	2240	2.3
RE122D3	Deep	2329	2.3
RE114D3	Deep	5058	0.8

Figure C-1. Background Hydrograph MW117-5
NWIRP Bethpage, NY

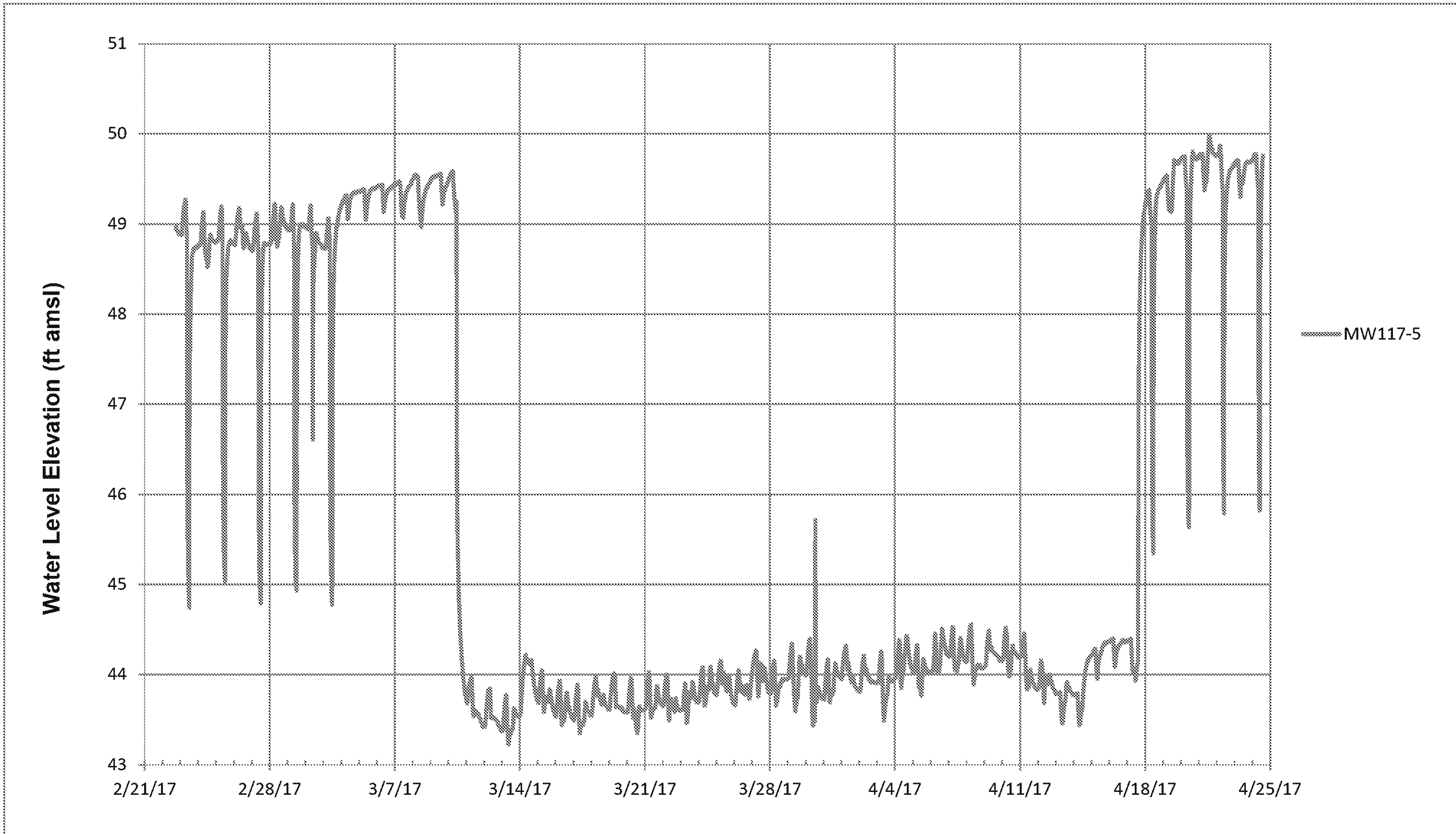


Figure C-2. Background Hydrographs RE105 Series
NWIRP Bethpage, NY

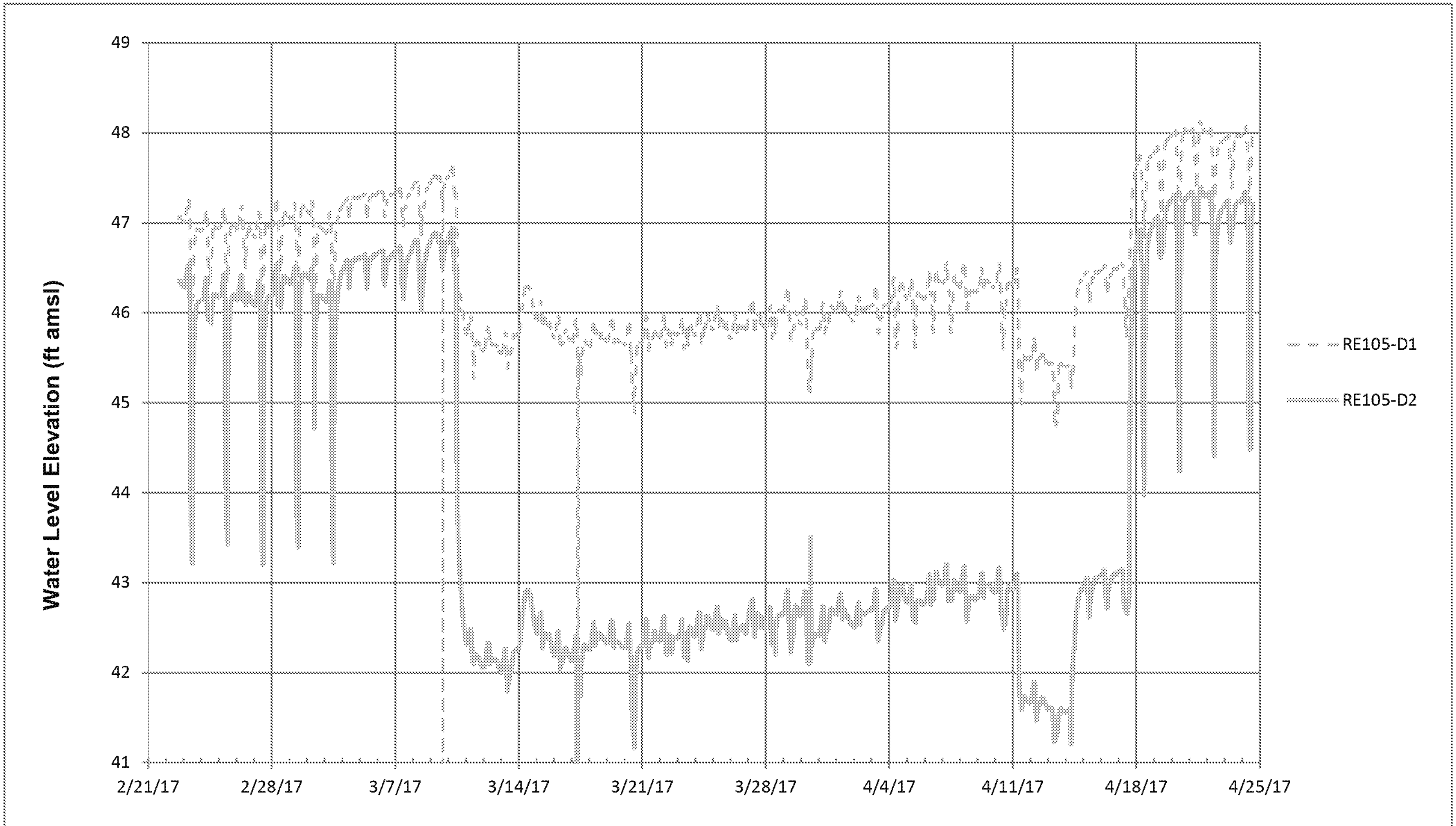


Figure C-3. Background Hydrographs RE103 Series
NWIRP Bethpage, NY

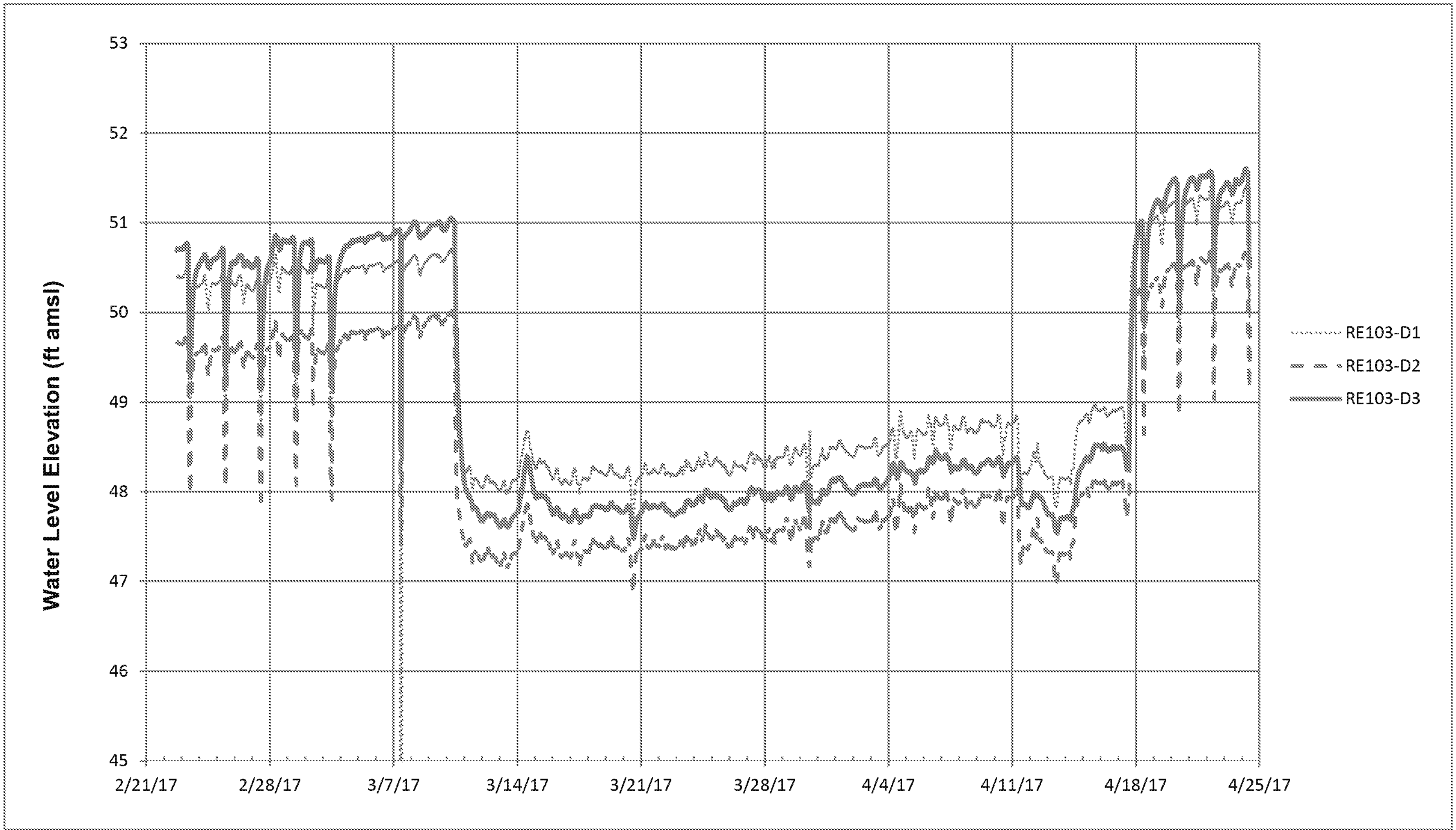


Figure C-4. Background Hydrographs RE108 Series
NWIRP Bethpage, NY

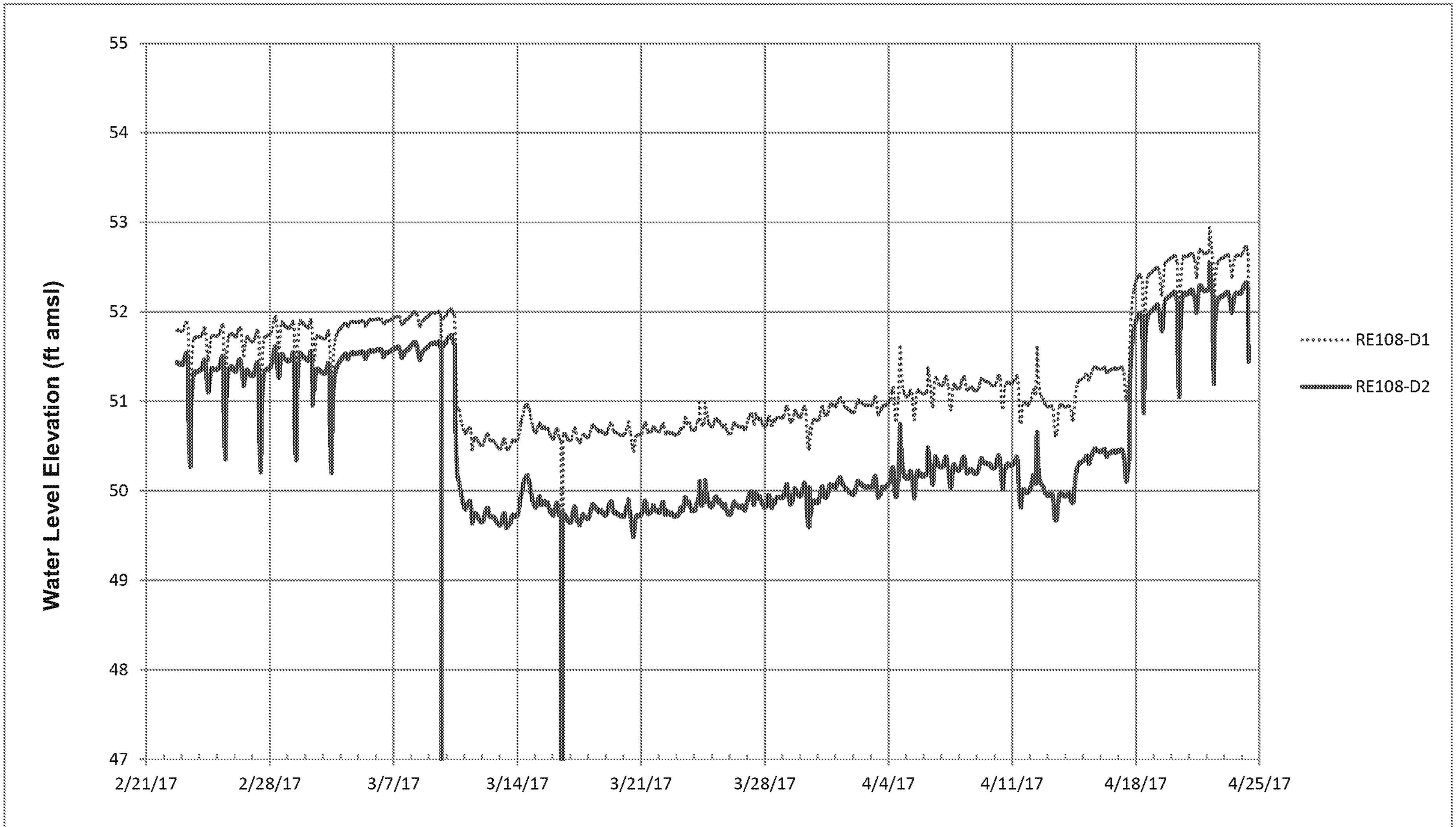


Figure C-5. Background Hydrographs RE120 Series
NWIRP Bethpage, NY

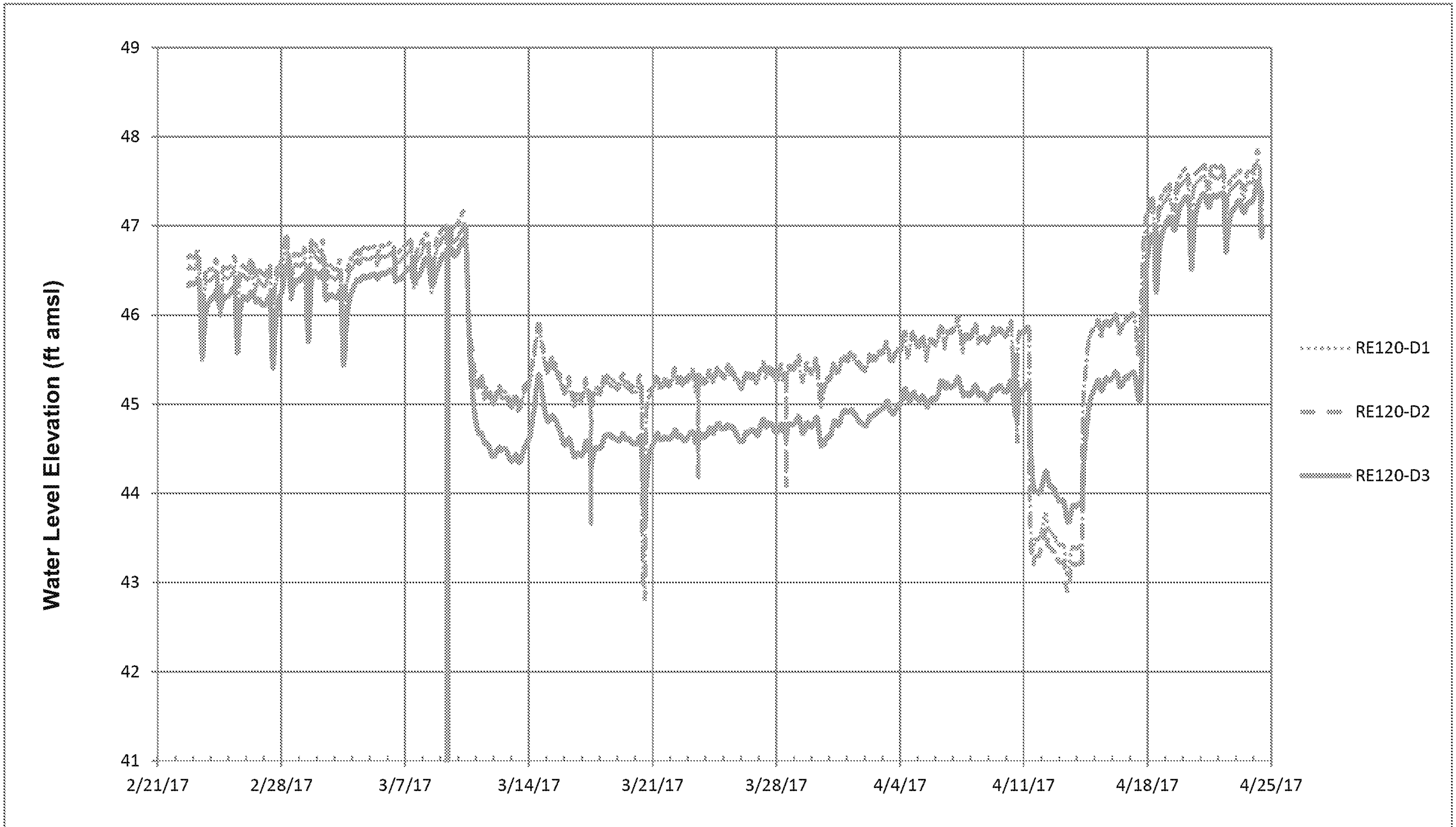


Figure C-6. Background Hydrographs RE122 Series
NWIRP Bethpage, NY

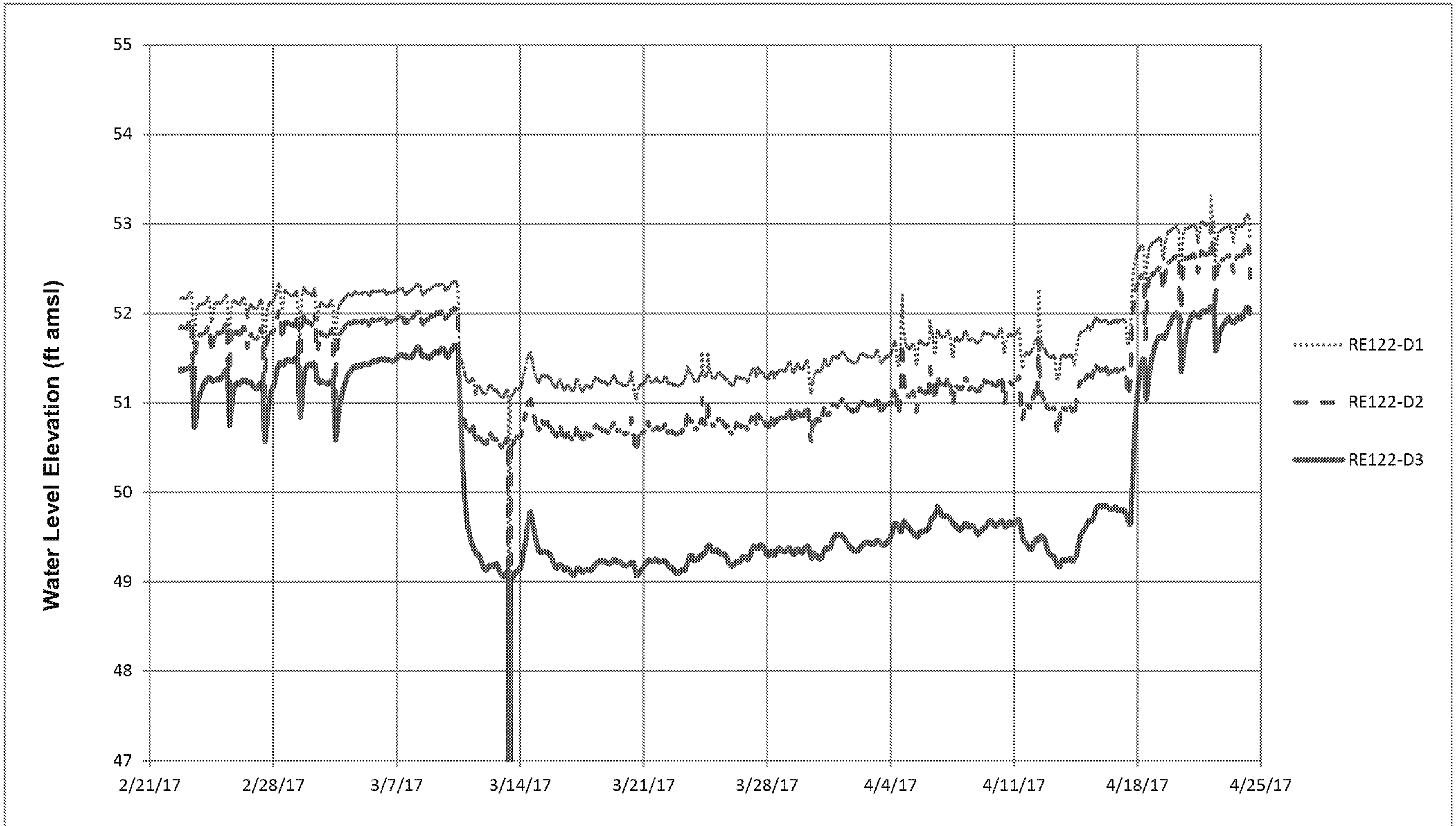


Figure C-7. Background Hydrograph RE107-D3
NWIRP Bethpage, NY

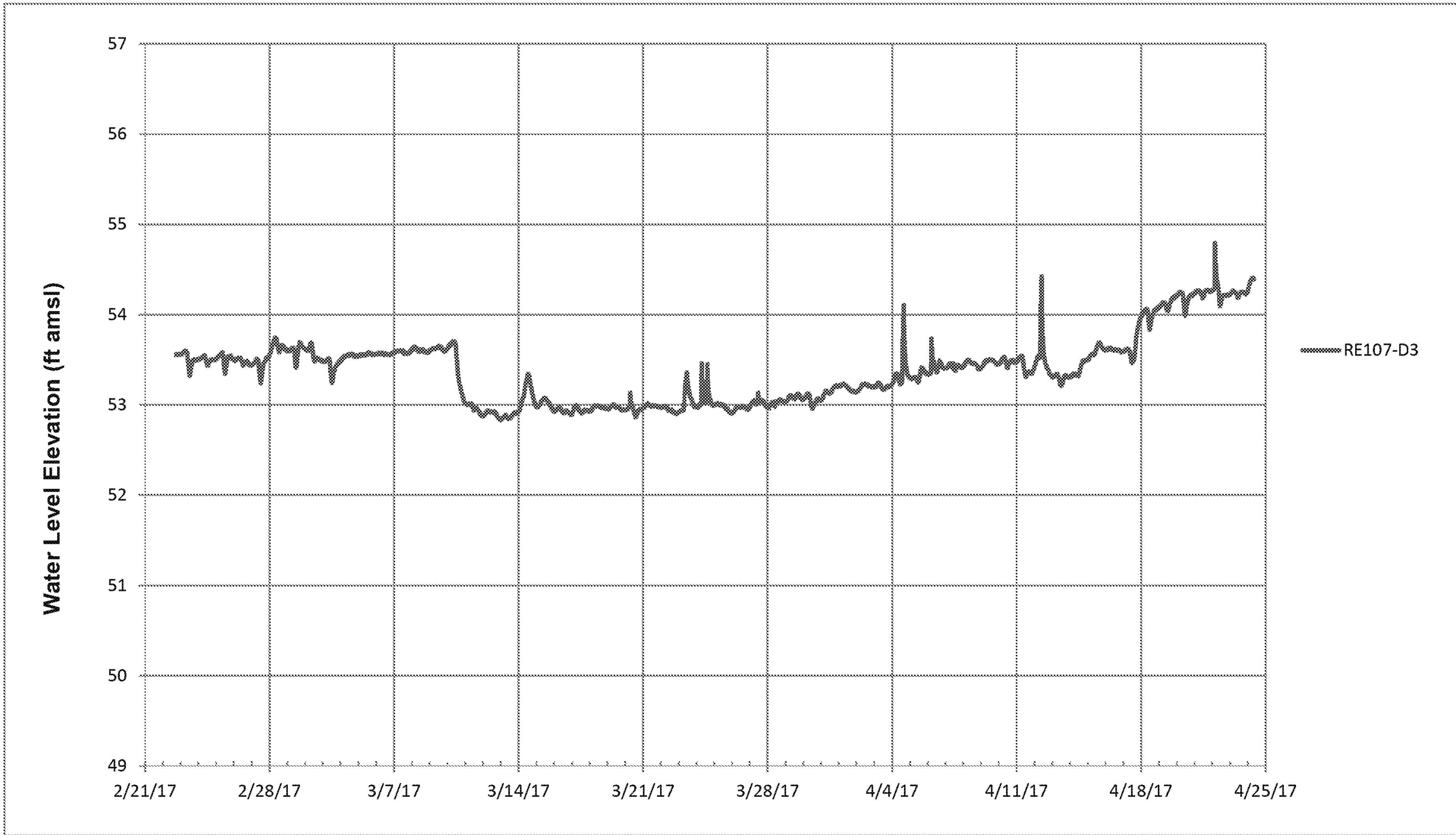


Figure C-8. Background Hydrographs RE114 Series
NWIRP Bethpage, NY

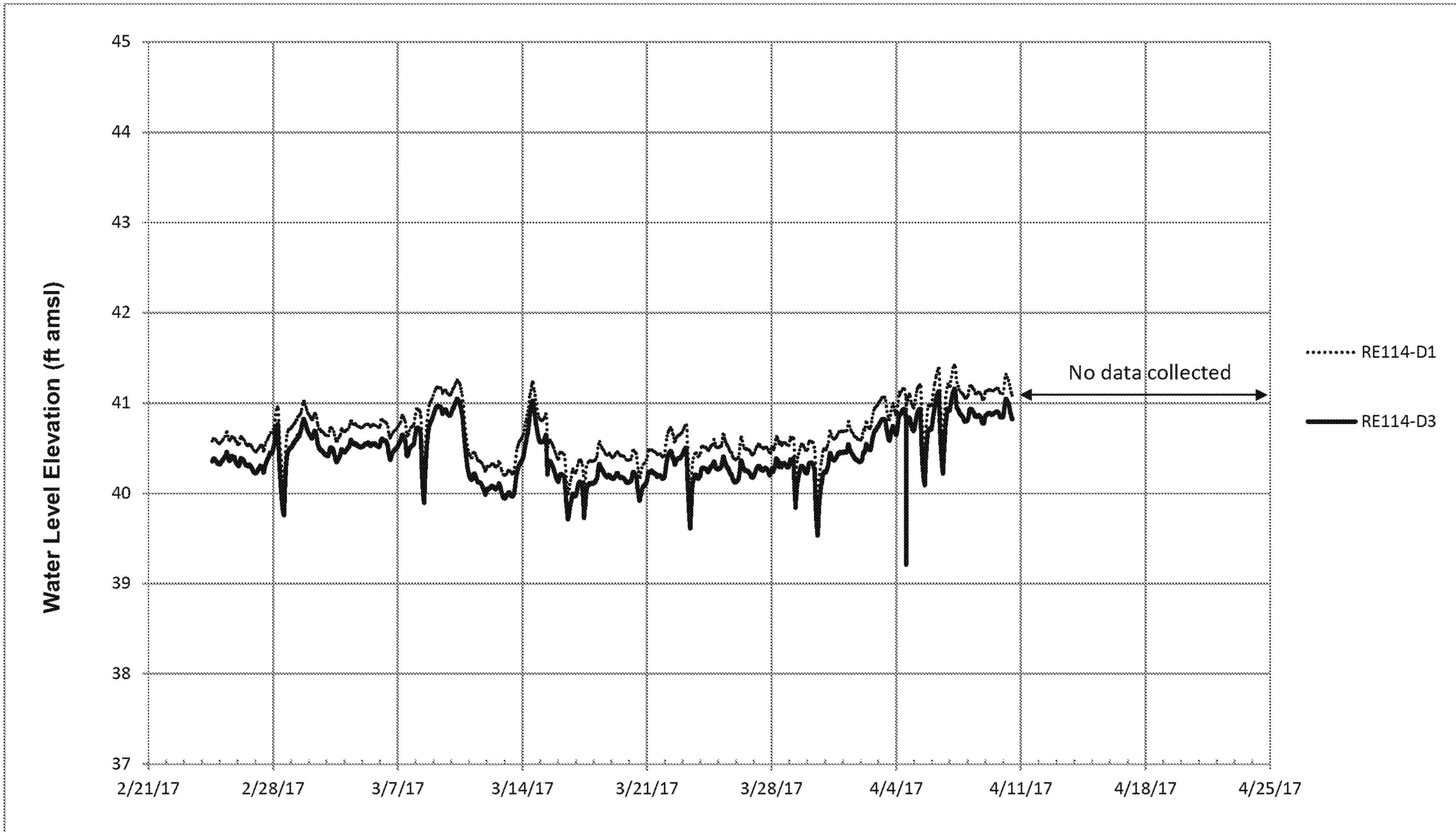
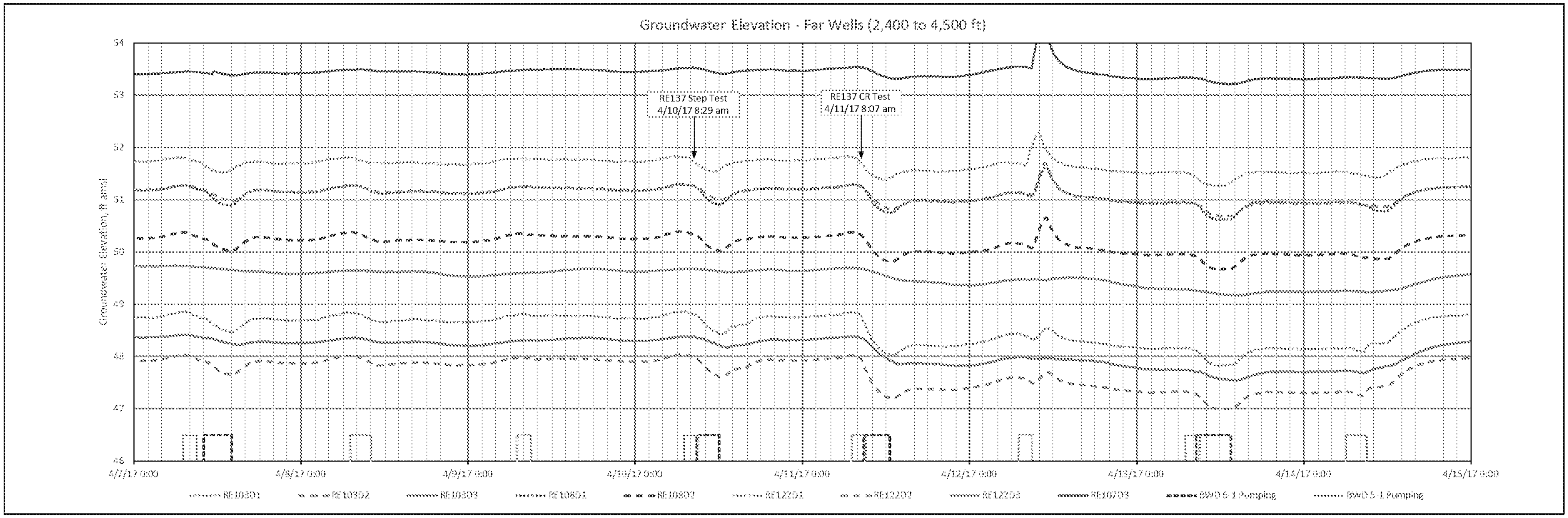


Figure C-9. Water Level Hydrographs for RE137 Testing
NWIRP Bethpage, NY



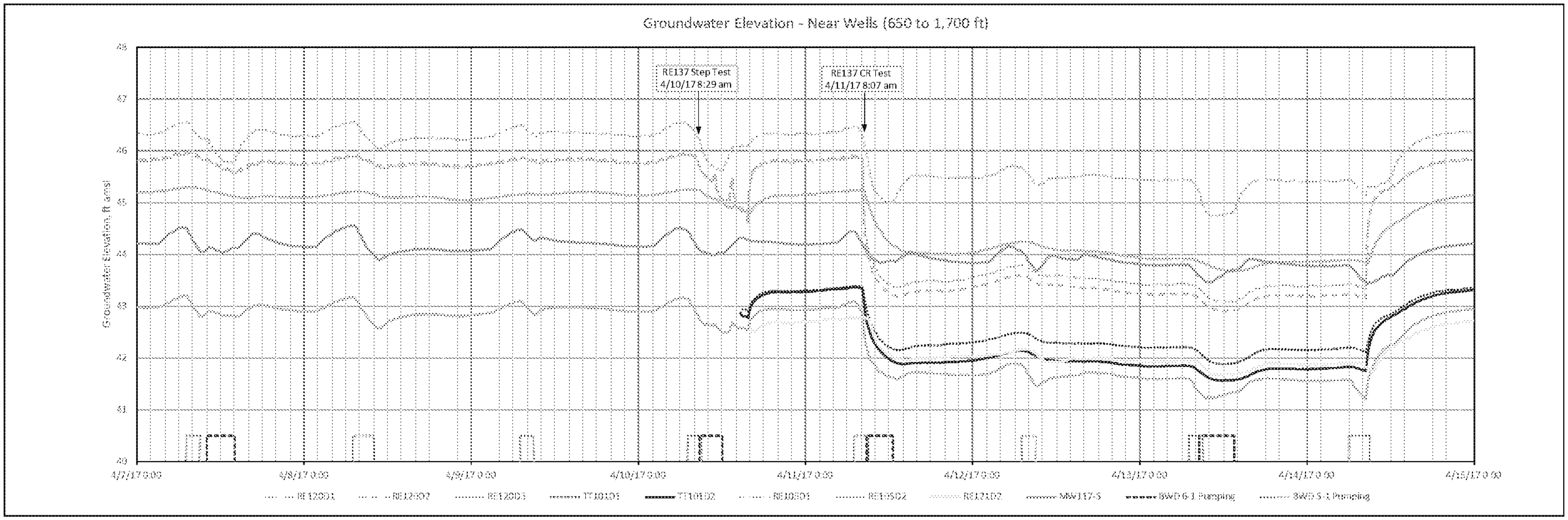
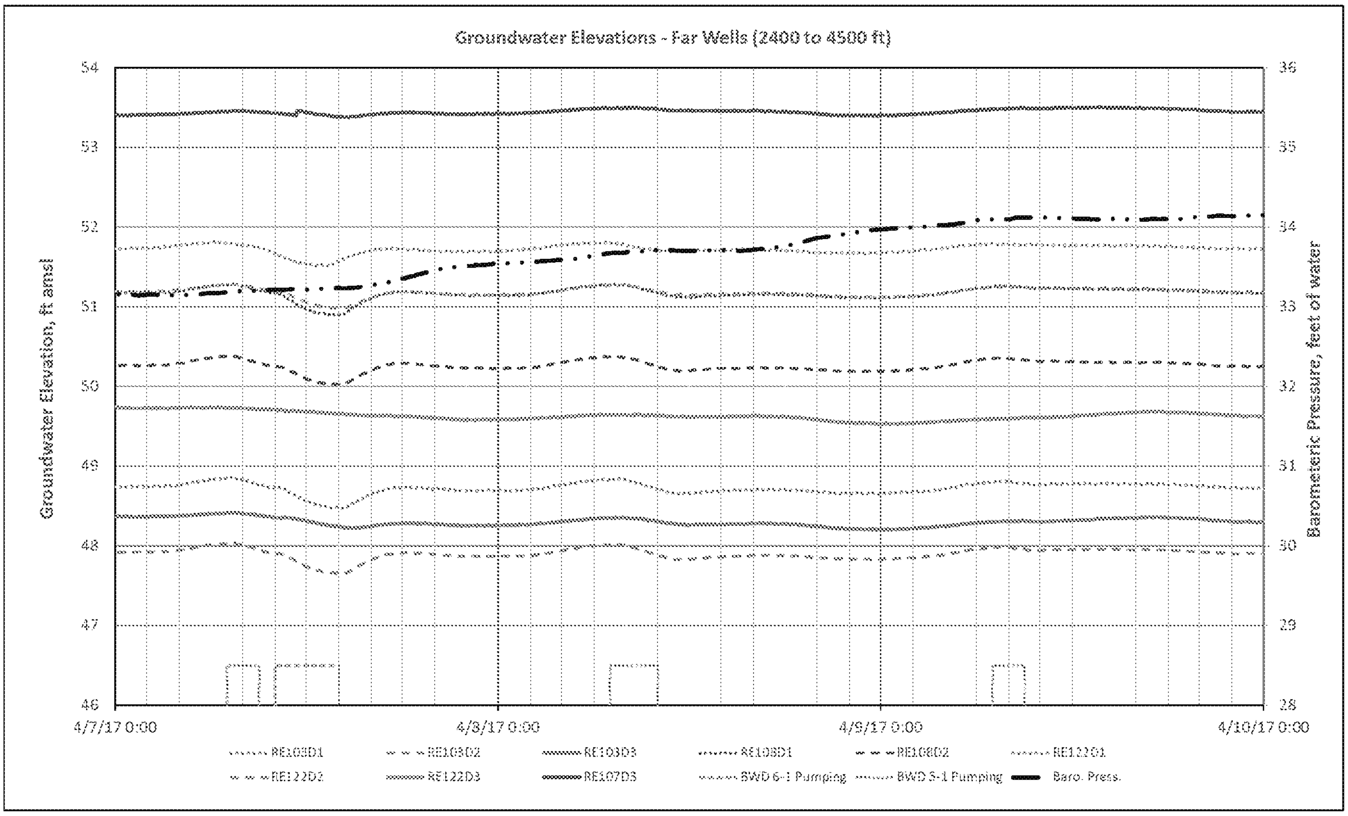
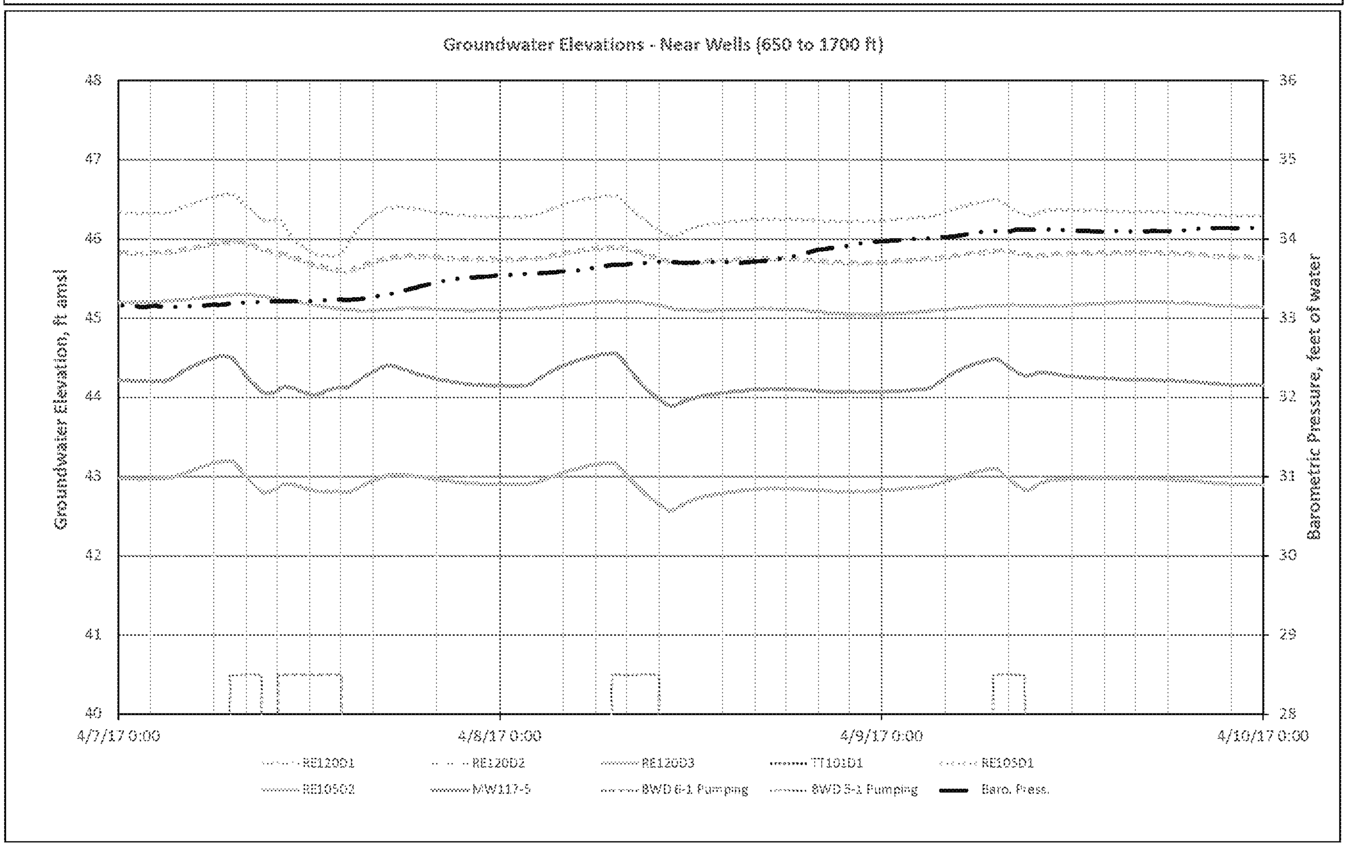


Figure C-10. Comparison of Barometric Pressure and Water Level Changes
NWIRP, Bethpage, NY





ATTACHMENT D

Drawdown Hydrographs

Well and Aquifer Test Analyses

Hantush-Jacob solution for a pumping test in a leaky aquifer

Hantush-Jacob solution for a step drawdown test in a leaky aquifer

Attachment D1. Leaky Aquifer Model Assumptions

Hantush-Jacob (1955)/Hantush (1964) Solution for a Pumping Test in a Leaky Aquifer

(Match > Solution)

Hantush and Jacob (1955) derived a solution for unsteady flow to a fully penetrating well in a homogeneous, isotropic leaky confined aquifer. The solution assumes a line source for the pumped well and therefore neglects wellbore storage.

Hantush (1964) extended the method to correct for partially penetrating wells and anisotropy. When you choose the Hantush-Jacob solution in AQTESOLV, you may analyze data for fully or partially penetrating wells.

The Hantush-Jacob solution can simulate variable-rate tests including recovery through the application of the principle of superposition in time. Use this solution to analyze both pumping and recovery data from constant- or variable-rate pumping tests.

Walton (1962) developed a manual curve-fitting procedure based on the Hantush-Jacob solution. To apply Walton's method in AQTESOLV, choose the Hantush-Jacob solution.

For a well performance test, you may choose the Hantush-Jacob (1955) solution for a step-drawdown test in a leaky confined aquifer.

Vandenberg (1977) presented a solution for evaluating drawdown a leaky confined aquifer bounded by two parallel no-flow boundaries (i.e., a leaky strip aquifer). In AQTESOLV, you may use the Hantush-Jacob solution in conjunction with aquifer boundaries to evaluate the same leaky strip aquifer problem as the Vandenberg method. Unlike Vandenberg's method, however, you may use AQTESOLV to evaluate partially penetrating wells and observation wells may be located at any radial distance from the pumped well.

- **Illustration**
- **Equations**

  Hantush and Jacob (1955) derived an analytical solution for predicting water-level changes in response to pumping in a homogeneous, isotropic leaky confined aquifer assuming steady flow (no storage) in the aquitard(s):

  $$s = \frac{Q}{4\pi T}\int_u^\infty e^{-y-r^2/4B^2y}\,\frac{dy}{y}$$

  $$u = \frac{r^2S}{4Tt}$$

  $$B = \sqrt{\frac{Tb'}{K'}}$$

  $$s_D = \frac{4\pi T}{Q}s$$

  $$t_D = \frac{Tt}{r^2S}$$

  where

  - b' is aquitard thickness [L]

- K' is vertical hydraulic conductivity in the aquitard [L/T]
- Q is pumping rate [L^3/T]
- r is radial distance [L]
- s is drawdown [L]
- S is storativity [dimensionless]
- t is time [T]
- T is transmissivity [L^2/T]

Hydrogeologists commonly refer to the integral expression in the drawdown equation as the Hantush well function for leaky aquifers, abbreviated as w(u,r/B). Therefore, we can write the Hantush drawdown equation in compact notation as follows:

$$s = \frac{Q}{4\pi T} w(u, r/B)$$

Hantush (1964) derived equations for the effects of partial penetration and anisotropy in a leaky aquifer. The partial penetration correction for a piezometer is as follows:

$$s = \frac{Q}{4\pi T}\left(w(u, r/B) + \frac{2b}{\pi(l-d)} \sum_{n=1}^{\infty} \frac{1}{n} [\sin(\frac{n\pi l}{b}) - \sin(\frac{n\pi d}{b})] \cdot \cos(\frac{n\pi z}{b}) \cdot w(u, \sqrt{\left(\frac{r}{B}\right)^2 + \frac{K_z}{K_r}\left(\frac{n\pi r}{b}\right)^2}) \right)$$

For an observation well, the following partial penetration correction applies:

$$s = \frac{Q}{4\pi T}\left(w(u, r/B) + \frac{2b^2}{\pi^2 (l-d)(l'-d')} \sum_{n=1}^{\infty} \frac{1}{n^2} [\sin(\frac{n\pi l}{b}) - \sin(\frac{n\pi d}{b})] \cdot [\sin(\frac{n\pi l'}{b}) - \sin(\frac{n\pi d'}{b})] \cdot w(u, \sqrt{\left(\frac{r}{B}\right)^2 + \frac{K_z}{K_r}\left(\frac{n\pi r}{b}\right)^2}) \right)$$

where

- b is aquifer thickness [L]
- d is depth to top of pumping well screen [L]
- d' is depth to top of observation well screen [L]
- l is depth to bottom of pumping well screen [L]
- l' is depth to bottom of observation well screen [L]
- K_r is radial hydraulic conductivity [L/T]
- K_z is vertical hydraulic conductivity [L/T]
- z is depth to piezometer opening [L]

At large distances, the effect of partial penetration becomes negligible when

$$r > 1.5b / \sqrt{K_z / K_r}$$

- **Assumptions**

- aquifer has infinite areal extent
- aquifer is homogeneous and of uniform thickness
- pumping well is fully or partially penetrating
- flow to pumping well is horizontal when pumping well is fully penetrating
- aquifer is leaky confined
- flow is unsteady
- water is released instantaneously from storage with decline of hydraulic head
- diameter of pumping well is very small so that storage in the well can be neglected
- confining bed(s) has infinite areal extent, uniform vertical hydraulic conductivity and uniform thickness
- confining bed(s) is overlain or underlain by an infinite constant-head plane source
- flow is vertical in the aquitard(s)

- **Data Requirements**
- **Solution Options**
- **Estimated Parameters**
- **Curve Matching Tips**
- **References**

Attachment D2. Step Test Model Assumptions

Hantush-Jacob (1955) Solution for a Step-Drawdown Test in a Leaky Aquifer Pro

(Match > Solution)

We modify the Hantush-Jacob (1955) solution for unsteady flow to a well in a leaky confined aquifer to simulate linear and nonlinear well losses using a general procedure for step-drawdown tests.

- **Illustration**
- **Equations**

The Hantush-Jacob (1955) solution for a fully penetrating pumping well in a leaky confined aquifer, modified to include linear and nonlinear well losses in a step-drawdown test, is expressed as follows:

$$s_w = \frac{Q}{4\pi T}\left[w(u, r/B) + 2S_w\right] + CQ^P$$

$$u = \frac{r^2 S}{4Tt}$$

$$s_D = \frac{4\pi T}{Q} s$$

$$t_D = \frac{Tt}{r^2 S}$$

where

- CQ^P is nonlinear well loss
- Q is pumping rate [L^3/T]
- r is radial distance [L]
- r/B is leakage factor [dimensionless]
- s_w is drawdown in the pumped well [L]
- S is storativity [dimensionless]
- S_w is wellbore skin factor [dimensionless]
- T is transmissivity [T^2/T]
- t is time [T]

AQTESOLV also lets you simulate partially penetrating wells with this solution.

The effective well radius employed in this solution to incorporate wellbore skin (linear well loss) leads to correlation in the equations between S (storativity) and Sw (wellbore skin factor). Therefore, you should estimate either S or Sw for a single-well test.

- **Assumptions**
  - aquifer has infinite areal extent
  - aquifer is homogeneous and of uniform thickness
  - pumping well is fully or partially penetrating
  - flow to pumping well is horizontal when pumping well is fully penetrating
  - aquifer is leaky confined
  - flow is unsteady
  - water is released instantaneously from storage with decline of hydraulic head
  - diameter of pumping well is very small so that storage in the well can be neglected
  - confining bed(s) has infinite areal extent, uniform vertical hydraulic conductivity and uniform thickness
  - confining bed(s) is overlain or underlain by an infinite constant-head plane source
  - flow in the aquitard(s) is vertical
- **Data Requirements**
- **Solution Options**
- **Estimated Parameters**
- **Curve Matching Tips**
- **References**

Figure D-1. Drawdown Hydrograph, Pumping Well RE137 Step Test
NWIRP, Bethpage, NY

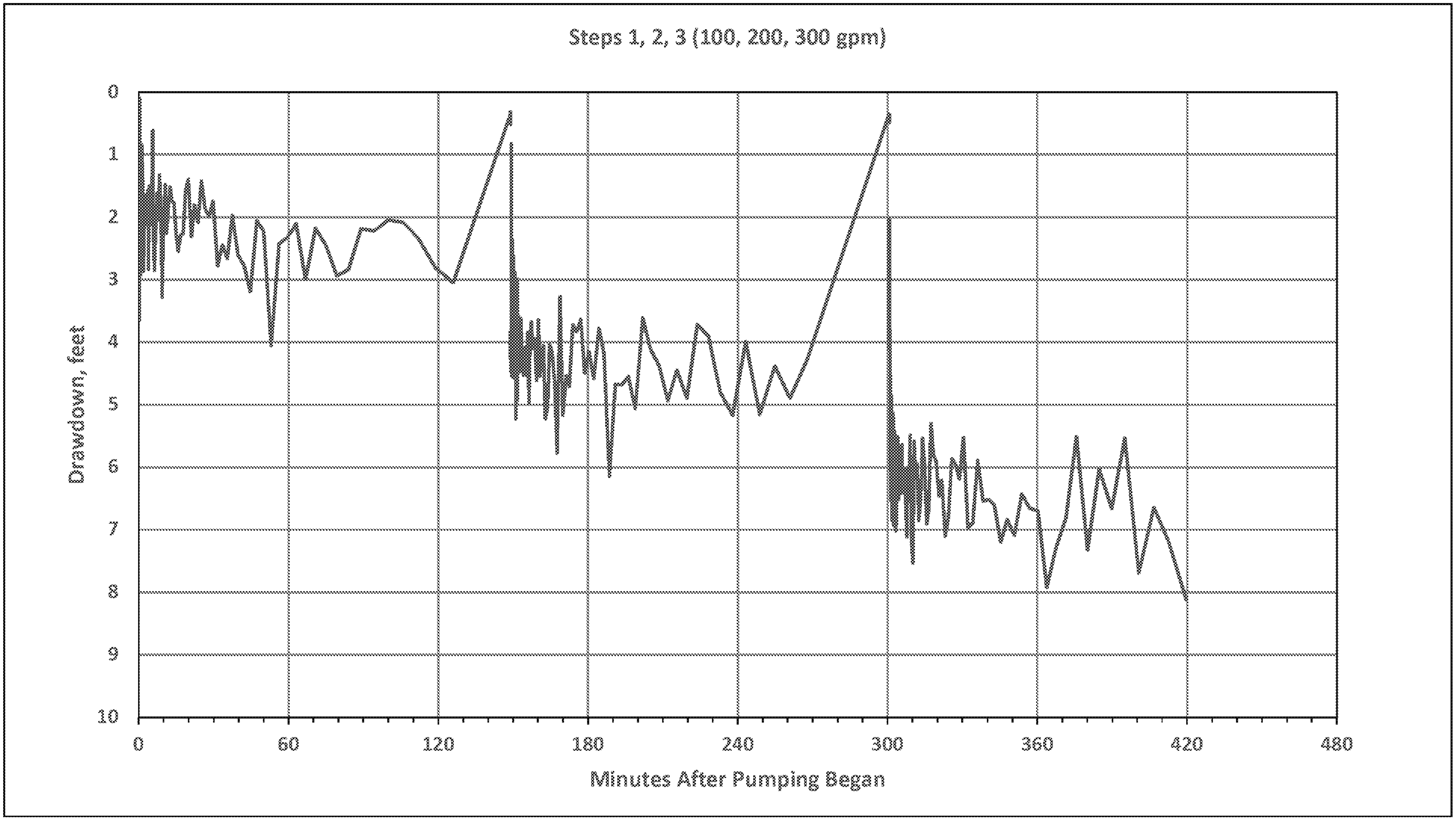


Figure D-2. Drawdown Hydrograph, Pumping Well RE137 Constant Rate Test
NWIRP, Bethpage, NY

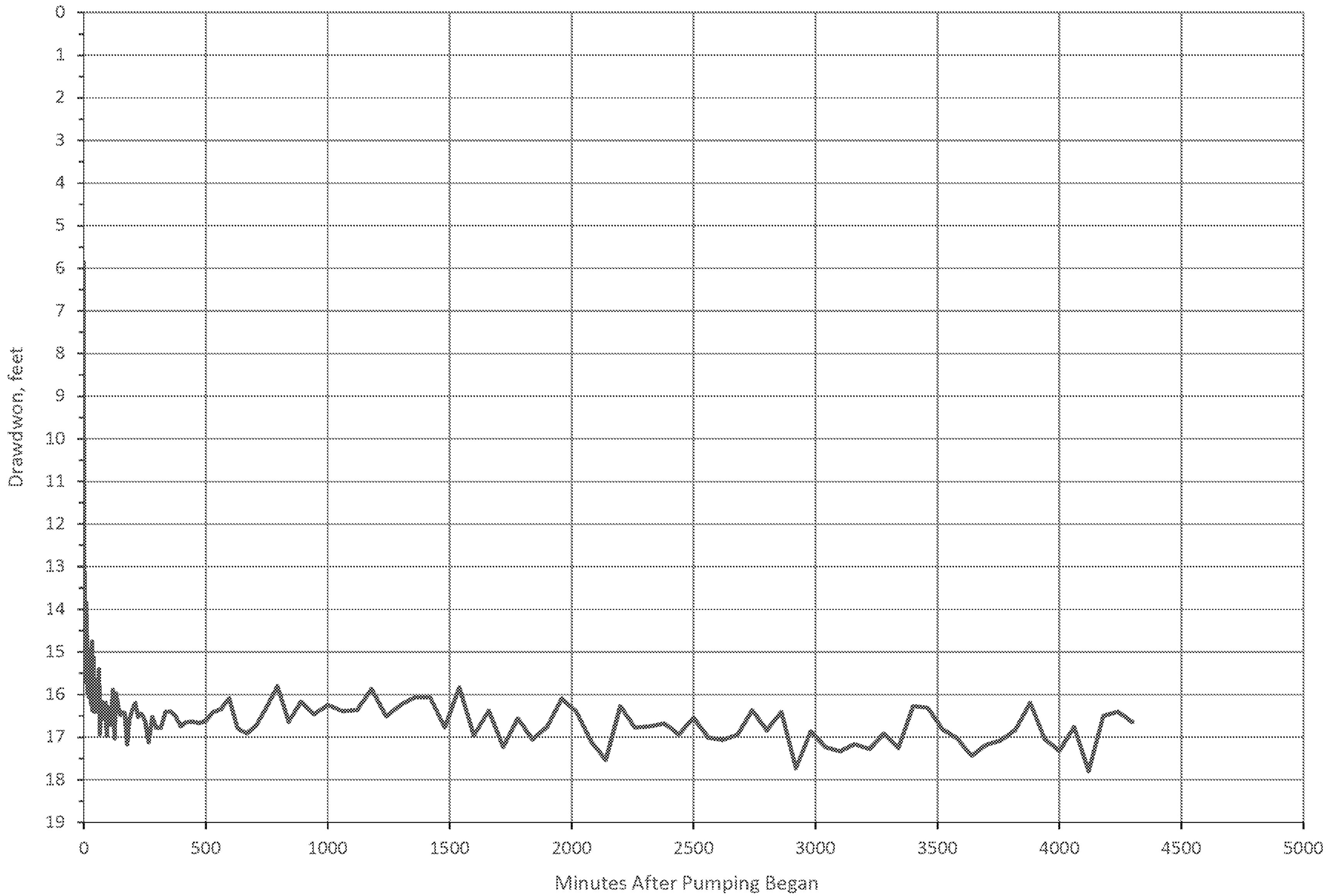
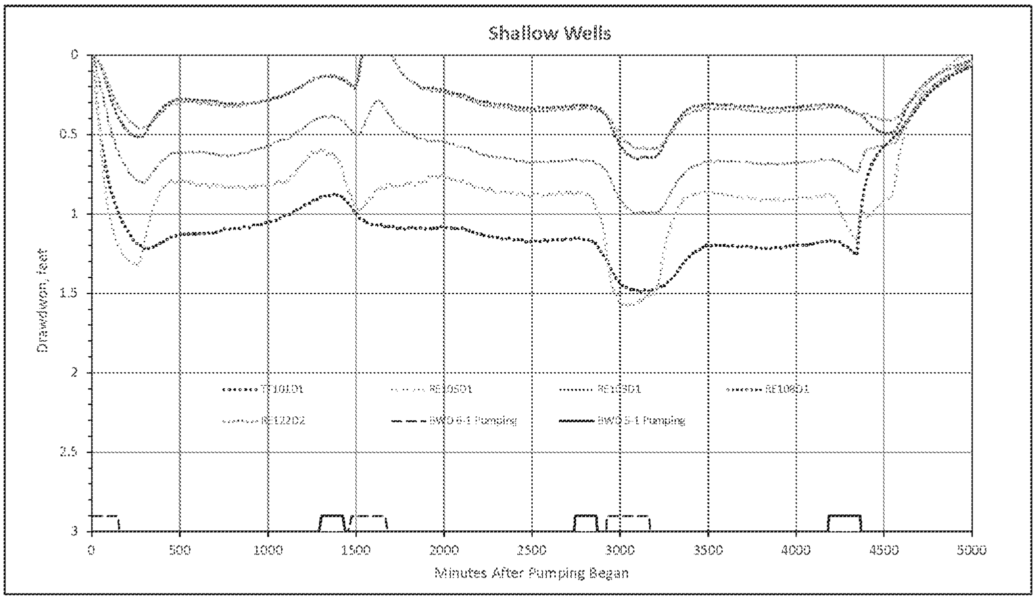
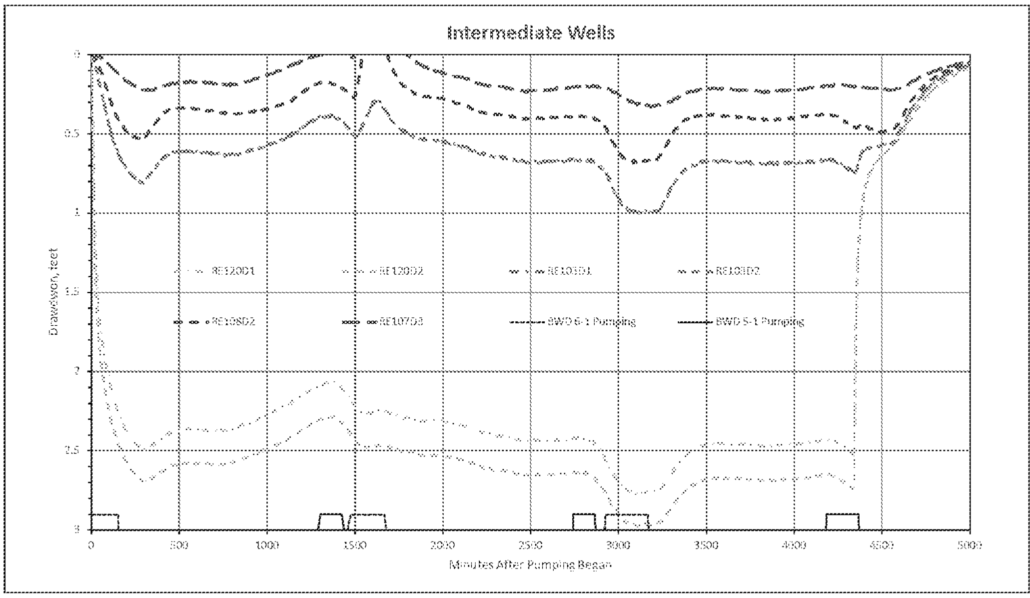


Figure D-3. Drawdown Hydrographs, Constant Rate Test Observation Wells
NWIRP, Bethpage, NY





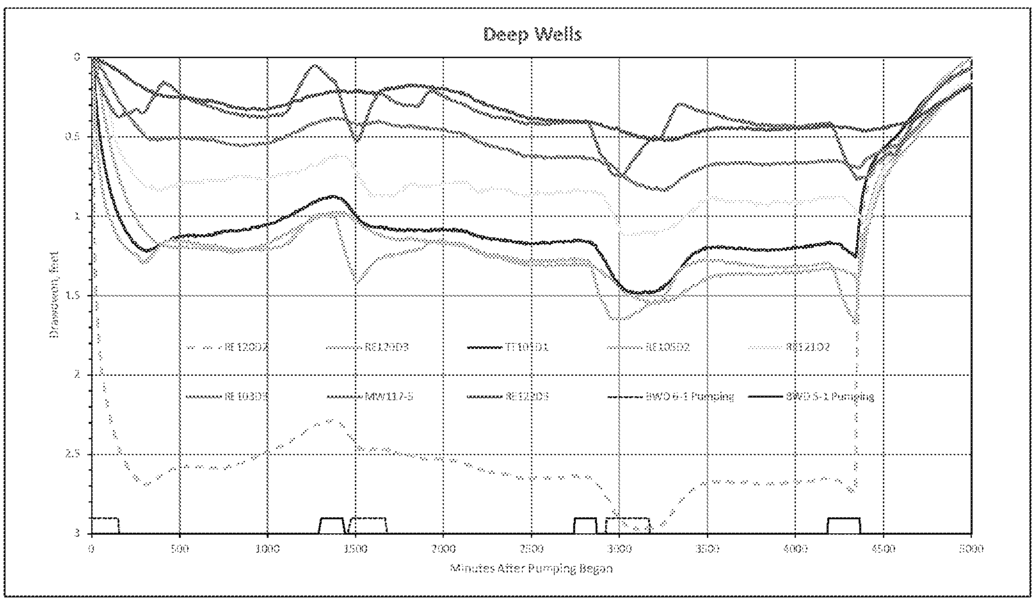
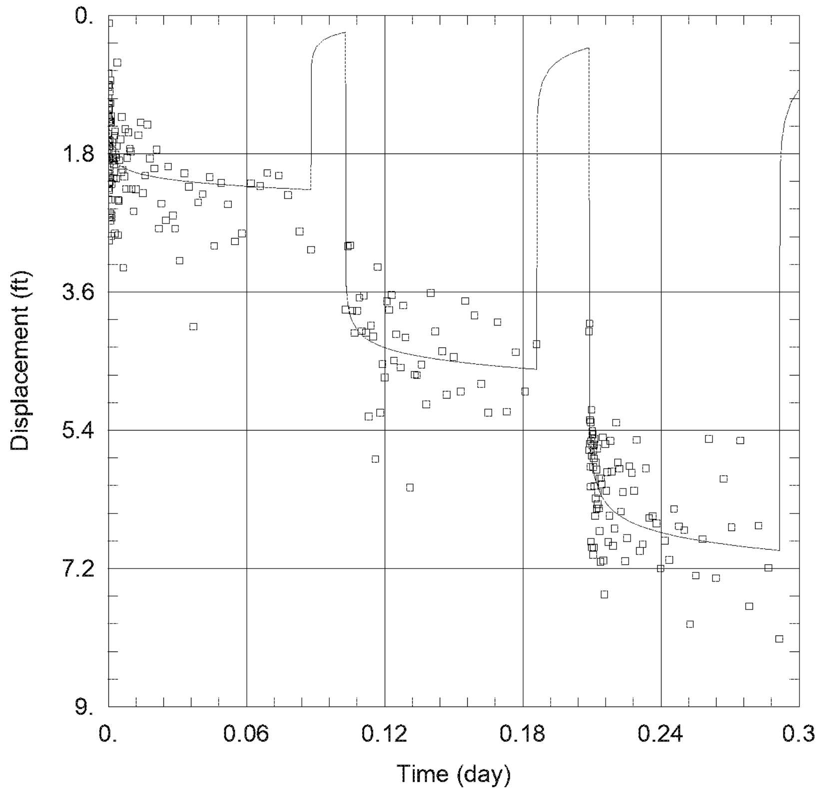


Figure D-4. RE137 Step Test Analysis



STEP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 Step Test, R2.aqt
Date: 09/22/17 Time: 12:13:53

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

AQUIFER DATA

Saturated Thickness: 580. ft
Anisotropy Ratio (Kz/Kr): 1.0E-5
Aquitard Thickness (b'): 10. ft
Aquitard Thickness (b"): 50. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137	1125692	204416
BWD 6-1	1126784	206200
BWD 5-1	1129164	205008

Observation Wells

Well Name	X (ft)	Y (ft)
▫ RE137	1125692	204416

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

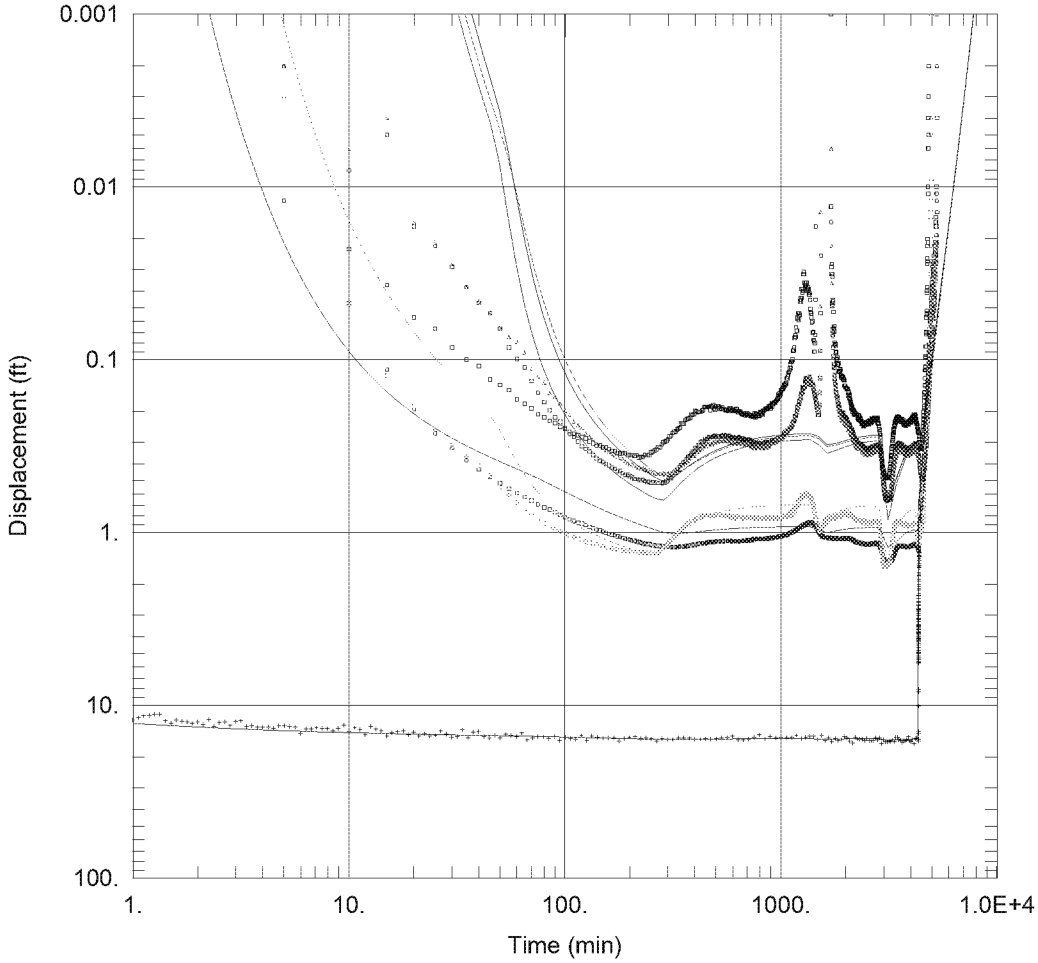
T = 6.648E+4 ft^2/day
r/B = 4.986E-6
C = 3.955E-7 day^2/ft^5

S = 0.006953
Sw = 2.849
P = 1.

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. day Rate (Q) in cu. ft/day

s(t) = 0.0001317Q + 3.955E-7$Q^{1.}$
W.E. = 94.54% (Q from last step)

Figure D-5. RE137 Constant Rate Test Analysis
Shallow Zone Wells



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 CR TEST Shallow MWs Rec.aqt
Date: 09/22/17 Time: 12:17:10

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125688	204392
BWD 6-1	1126784	206200
BWD 5-1	1129164	205008

Observation Wells

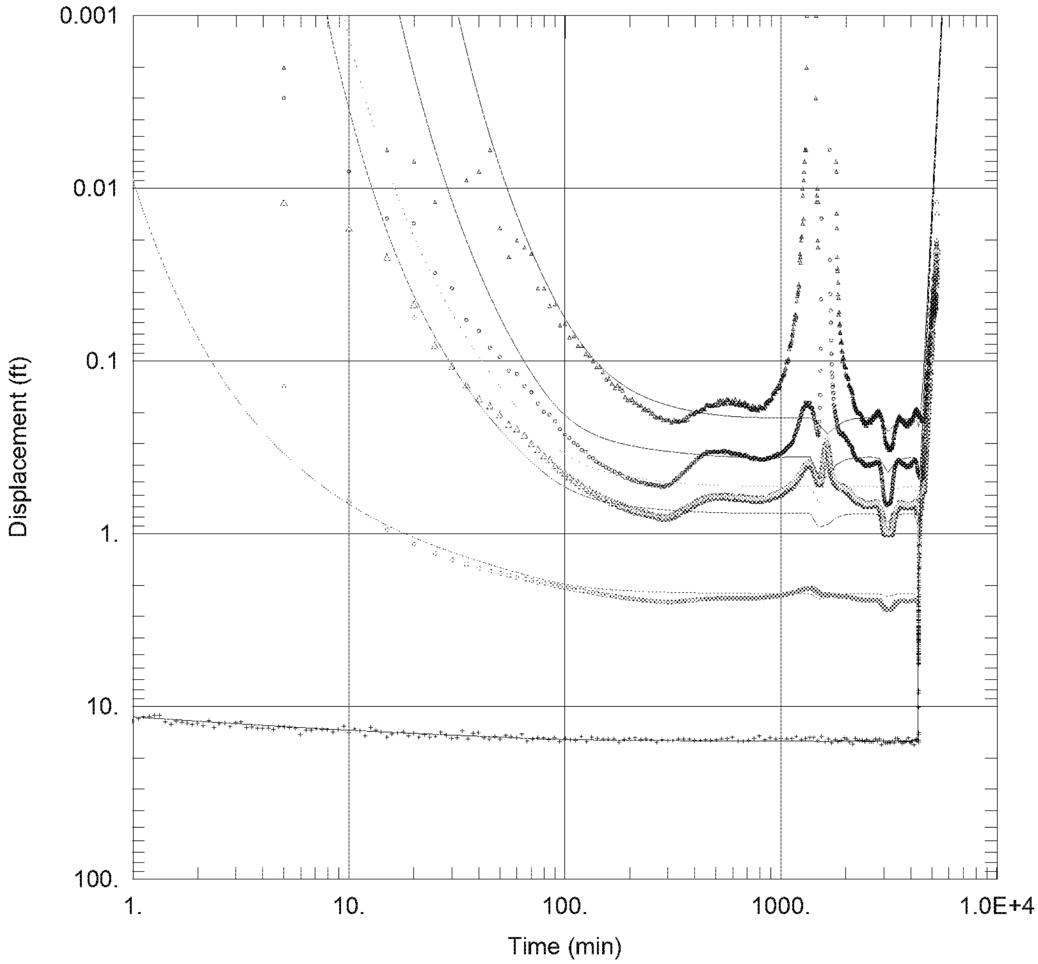
Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125688	204392
TT101D1 (871')	1125484	203545
RE105D1 (1190')	1126664	205073
RE108D1 (3257')	1125500	207665
RE122D2 (3470')	1124979	207789
RE122D1 (3498')	1124982	207818

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 4.485E+4 ft^2/day
1/B = 0.0002386 ft^{-1}
b = 580. ft
S = 0.001436
Kz/Kr = 0.02939

Figure D-6. RE137 Constant Rate Test Analysis
Intermediate Zone Wells



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 CR TEST Interm MWs Rec, r1.aqt
Date: 09/22/17 Time: 12:18:58

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125692	204416
BWD 6-1	1126784	206200
BWD 5-1	1129164	205008

Observation Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125692	204416
RE120D1 (658')	1125061	204590
RE103D2 (2361')	1125160	206693
RE103D1 (2373')	1125112	206695
RE108D2 (3277')	1125485	207663
RE107D3 (4534')	1123760	208495

SOLUTION

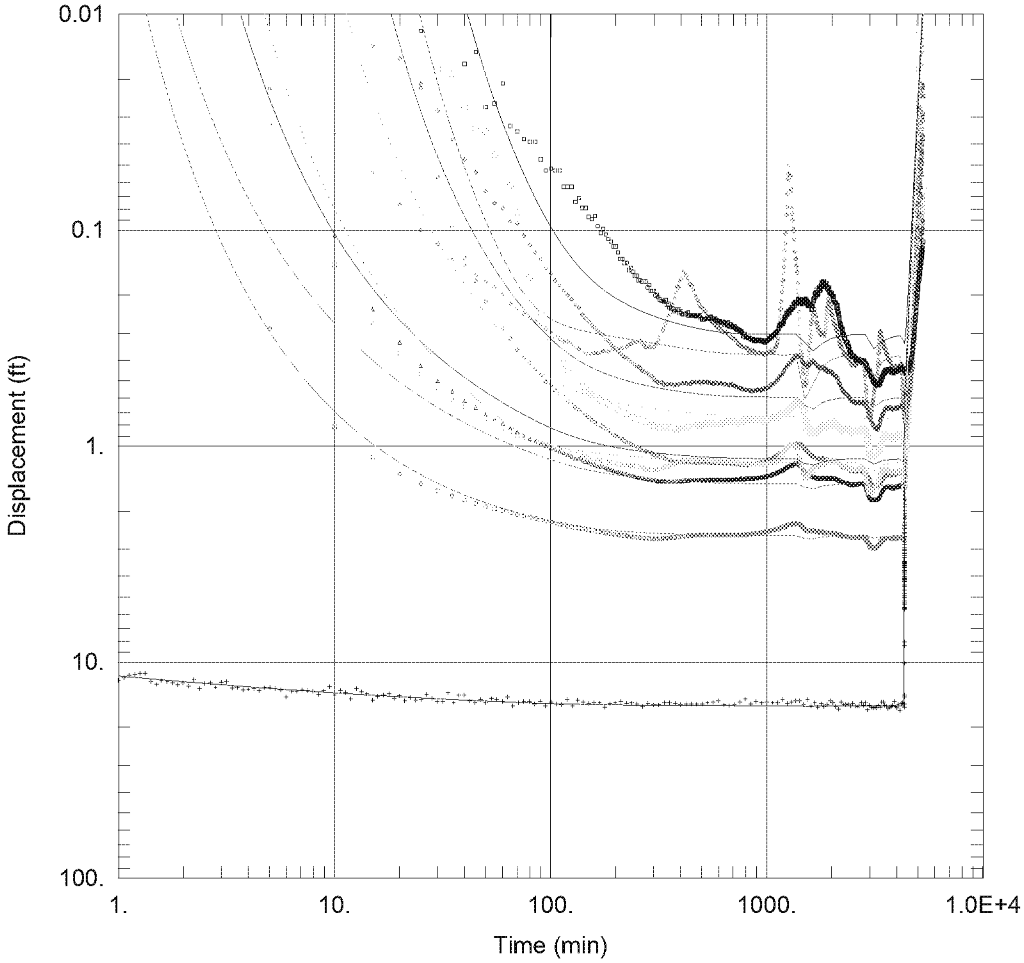
Aquifer Model: Leaky

Solution Method: Hantush-Jacob

$T = 5.333E+4\ ft^2/day$
$1/B = 0.0003252\ ft^{-1}$
$b = 580.\ ft$

$S = 0.001095$
$Kz/Kr = 0.0004847$

Figure D-7. RE137 Constant Rate Test Analysis
Deep Zone Wells



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 CR TEST Deep MWs Rec, r1.aqt
Date: 09/22/17 Time: 12:20:40

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 04/11/17

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125692	204416
BWD 6-1	1126784	206200
BWD 5-1	1129164	205008

Observation Wells

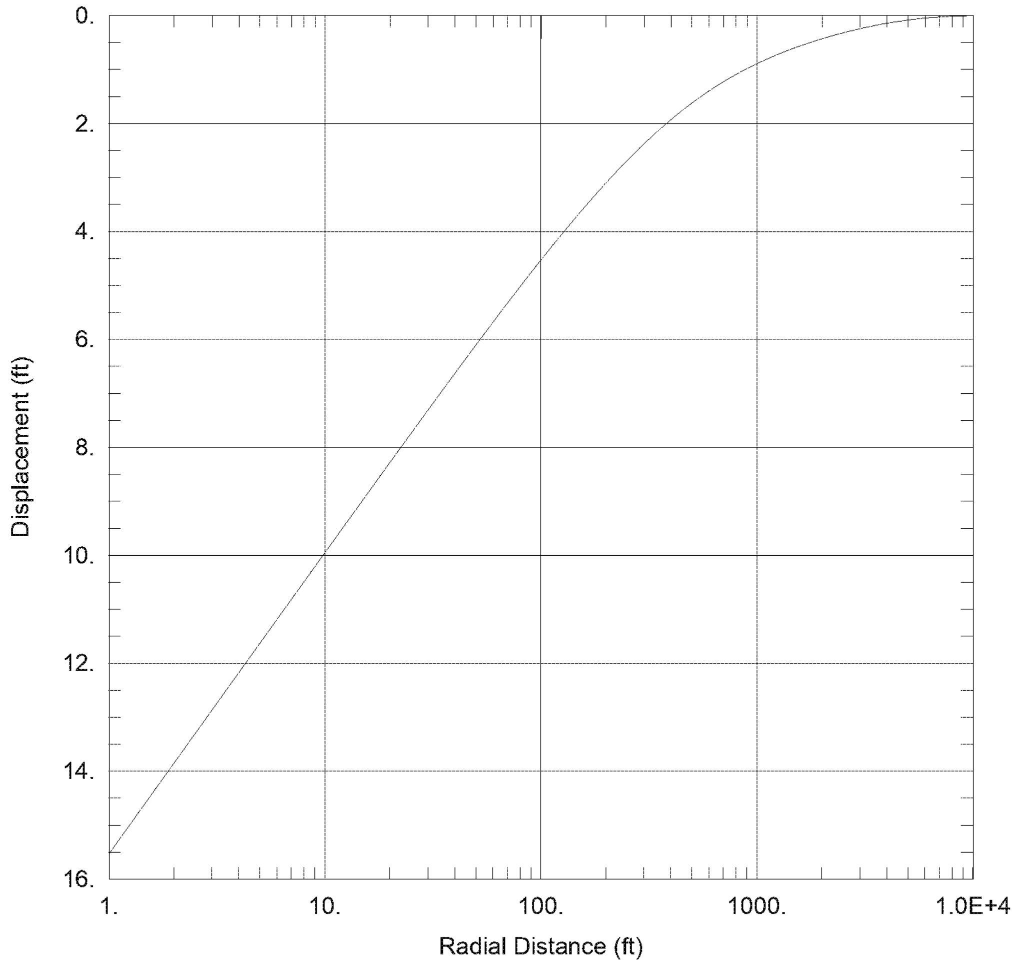
Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125692	204416
RE120D2 (655')	1125060	204577
RE120D3 (666')	1125062	204618
TT101D2 (879')	1125454	203545
RE105D2 (1175')	1126652	205064
RE121D2 (1697')	1126664	203003
RE103D3 (2365')	1125145	206693
MW117-5 (2919')	1127141	206924
RE122D3 (3456')	1124981	207775

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.093E+4 ft^2/day
$1/B$ = 0.0003388 ft^{-1}
b = 580. ft
S = 0.001476
Kz/Kr = 0.001309

Figure D-8. RE137 Pumping Distance-Drawdown
Shallow Zone



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 Shallow Predict Ddn, Rec.aqt
Date: 08/29/17 Time: 15:45:35

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125688	204392

Observation Wells

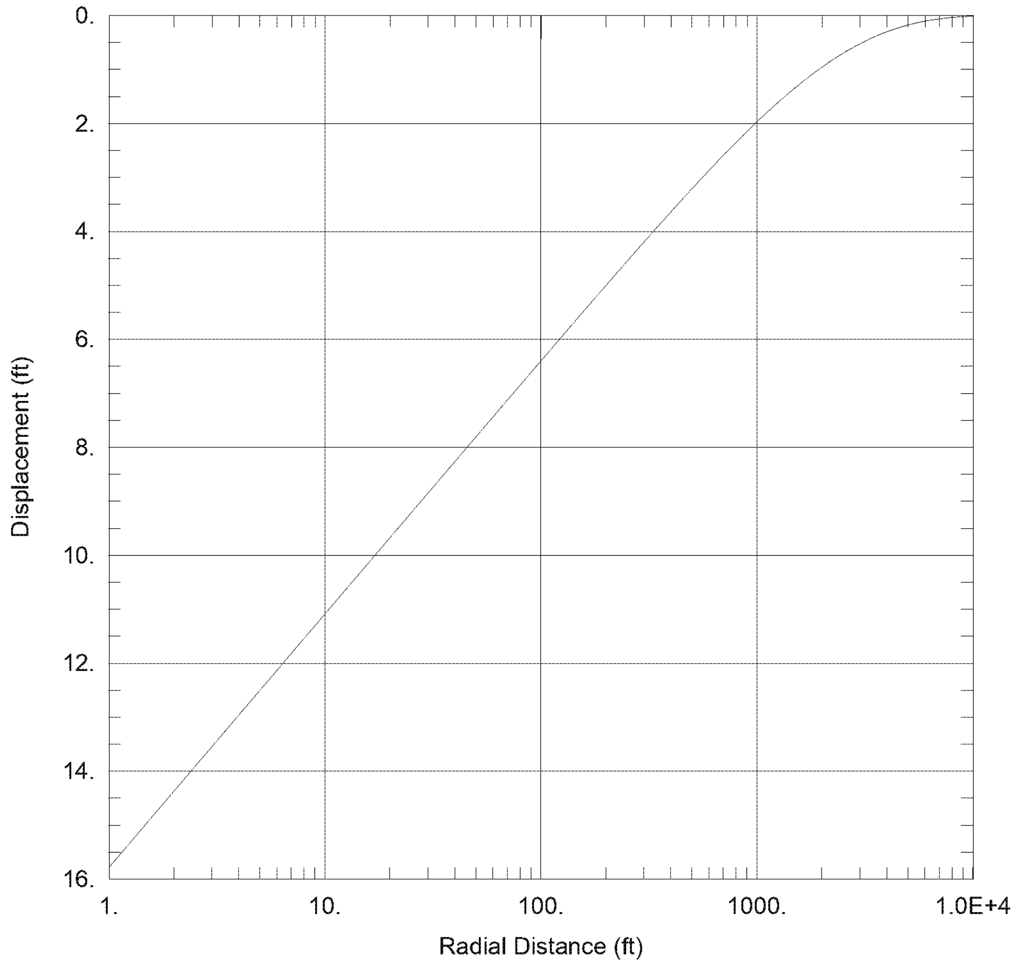
Well Name	X (ft)	Y (ft)
▫ RE137 (@94%)	1125688	204392

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 4.485E+4 ft^2/day
S = 0.0014
r/B = 0.0002
Kz/Kr = 0.0294
b = 580. ft

Figure D-9. RE137 Pumping Distance-Drawdown
Intermediate Zone



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 Interm Predict Ddn, Rec.aqt
Date: 08/29/17 Time: 15:47:05

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125688	204392

Observation Wells

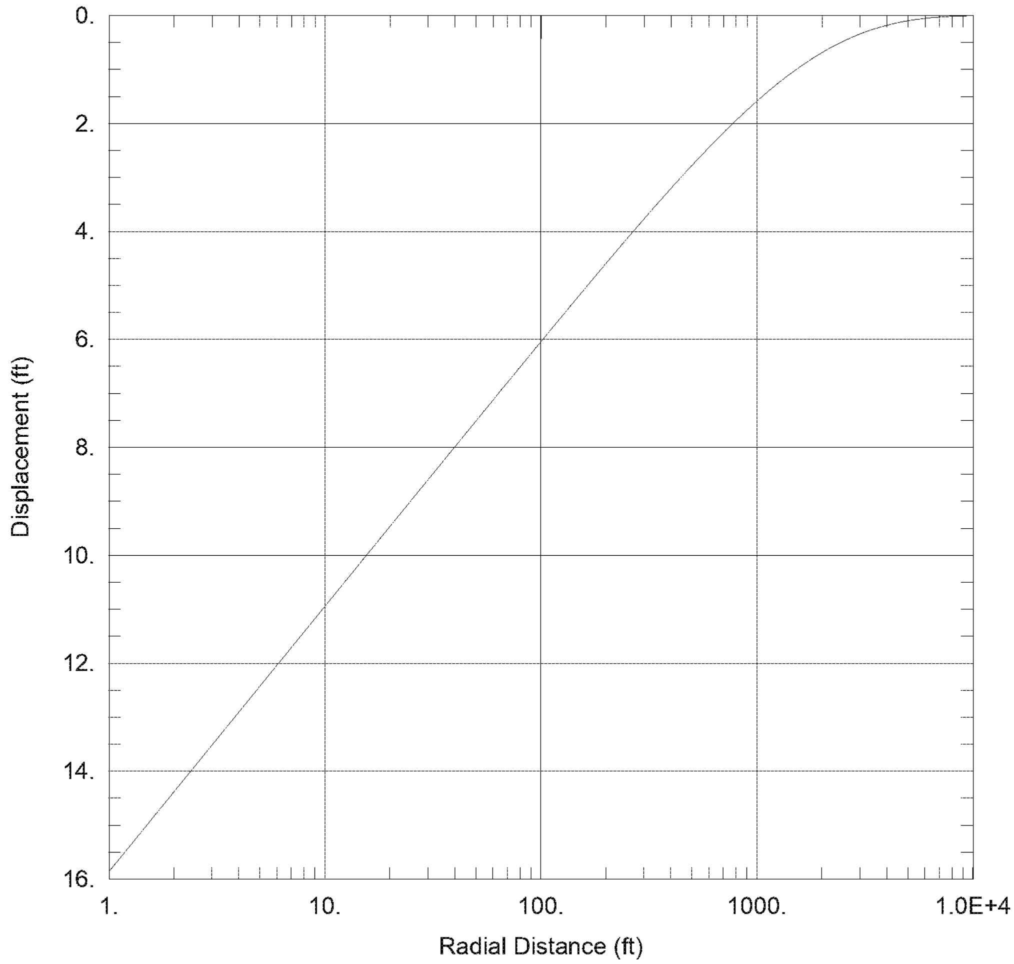
Well Name	X (ft)	Y (ft)
▫ RE137 (@94%)	1125688	204392

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 5.333E+4 ft^2/day
S = 0.0011
r/B = 0.0003
Kz/Kr = 0.0005
b = 580. ft

Figure D-10. RE137 Pumping Distance-Drawdown
Deep Zone



CR PUMP TEST

Data Set: G:\Knoxville\Ajenkins\Bethpage\WE80\RE137\Pump Test\AQTSOLV\RE137 Deep Predict Ddn, Rec.aqt
Date: 10/03/17 Time: 12:10:03

PROJECT INFORMATION

Company: EnSafe
Client: Navy
Project: WE80
Location: Bethpage, NY
Test Well: RE137
Test Date: 041017

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
RE137 (@94%)	1125688	204392

Observation Wells

Well Name	X (ft)	Y (ft)
▫ RE137 (@94%)	1125688	204392

SOLUTION

Aquifer Model: Leaky

Solution Method: Hantush-Jacob

T = 5.093E+4 ft^2/day
r/B = 0.0003388
b = 580. ft

S = 0.001476
Kz/Kr = 0.001309

RESOLUTION CONSULTANTS

ATTACHMENT E

Groundwater Results Summary

E-1
ANALYTICAL DATA SUMMARY
RE137 POST-DEVELOPMENT BASELINE MARCH 28, 2017
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE137
Sample Date		3/28/2017
Sample ID		RE137-GW-032817-INF
Sample type code		N
VOC 8260C	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	<1 U
1,1,2,2-TETRACHLOROETHANE	5	<1 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	**29.1**
1,1,2-TRICHLOROETHANE	1	**1.2**
1,1-DICHLOROETHANE	5	**1.2**
1,1-DICHLOROETHENE	5	<1 U
1,2,4-TRICHLOROBENZENE	5	<1 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	***<1 U***
1,2-DIBROMOETHANE	NL	<1 U
1,2-DICHLOROBENZENE	3	<1 U
1,2-DICHLOROETHANE	5	<1 U
1,2-DICHLOROPROPANE	1	<1 U
1,3-DICHLOROBENZENE	3	<1 U
1,4-DICHLOROBENZENE	3	<1 U
2-BUTANONE	50	<1 U
2-HEXANONE	50	<1 U
4-METHYL-2-PENTANONE	NL	<1 U
ACETONE	50	<5 U
BENZENE	1	<1 U
BROMODICHLOROMETHANE	50	<1 U
BROMOFORM	50	<1 U
BROMOMETHANE	5	<1 U
CARBON DISULFIDE	60	<1 U
CARBON TETRACHLORIDE	5	**4.2**
CHLOROBENZENE	5	<1 U
CHLOROETHANE	5	<1 U
CHLOROFORM	7	**1.9**
CHLOROMETHANE	5	<1 U
CIS-1,2-DICHLOROETHENE	5	**4.7**
CIS-1,3-DICHLOROPROPENE	0.4	***<1 U***
CYCLOHEXANE	NL	<1 U
DIBROMOCHLOROMETHANE	5	<1 U
DICHLORODIFLUOROMETHANE	5	<1 U
ETHYLBENZENE	5	<1 U
ISOPROPYLBENZENE	5	<1 U
M- AND P-XYLENE	NL	<1 U
METHYL ACETATE	NL	<1 U
METHYL CYCLOHEXANE	NL	<1 U
METHYL TERT-BUTYL ETHER	10	<1 U
METHYLENE CHLORIDE	5	<1 U
O-XYLENE	NL	<1 U
STYRENE	5	<1 U
TETRACHLOROETHENE	5	**3.8 J**
TOLUENE	5	<1 U
TRANS-1,2-DICHLOROETHENE	5	<1 U
TRANS-1,3-DICHLOROPROPENE	0.4	***<1 U***
TRICHLOROETHENE	5	**1920**
TRICHLOROFLUOROMETHANE	5	<1 U
VINYL CHLORIDE	2	<1 U
XYLENES, TOTAL	5	<1 U

E-1
ANALYTICAL DATA SUMMARY
RE137 POST-DEVELOPMENT BASELINE MARCH 28, 2017
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE137
Sample Date		3/28/2017
Sample ID		RE137-GW-032817-INF
Sample type code		N
SVOCs 8270D	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	<5.0 UJ
2,4,5-TRICHLOROPHENOL	NL	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	<5.0 U
2,4-DICHLOROPHENOL	1	***<5.0 U***
2,4-DIMETHYLPHENOL	1	***<5.0 U***
2,4-DINITROPHENOL	1	***<10.0 U***
2,4-DINITROTOLUENE	5	<5.0 U
2,6-DINITROTOLUENE	5	<5.0 U
2-CHLORONAPHTHALENE	NL	<5.0 U
2-CHLOROPHENOL	NL	<5.0 U
2-METHYLNAPHTHALENE	NL	<5.0 U
2-METHYLPHENOL	NL	<5.0 U
2-NITROANILINE	5	<5.0 UJ
2-NITROPHENOL	NL	<5.0 U
3- AND 4-METHYLPHENOL	NL	<5.0 U
3,3-DICHLOROBENZIDINE	5	<5.0 U
3-NITROANILINE	5	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	<5.0 U
4-CHLOROANILINE	5	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	<5.0 U
4-NITROANILINE	5	<5.0 U
4-NITROPHENOL	NL	<10.0 U
ACENAPHTHENE	NL	<5.0 U
ACENAPHTHYLENE	NL	<5.0 U
ACETOPHENONE	NL	<5.0 U
ANTHRACENE	NL	<5.0 U
ATRAZINE	7.5	<5.0 U
BENZALDEHYDE	NL	<5.0 U
BENZO[A]ANTHRACENE	NL	<5.0 U
BENZO[A]PYRENE	NL	<5.0 U
BENZO[B]FLUORANTHENE	NL	<5.0 U
BENZO[G,H,I]PERYLENE	NL	<5.0 U
BENZO[K]FLUORANTHENE	NL	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	***<5.0 U***
BIS(2-ETHYLHEXYL)PHTHALATE	5	<5.0 U
BUTYLBENZYLPHTHALATE	NL	<5.0 U
CAPROLACTAM	NL	<5.0 U
CARBAZOLE	NL	<5.0 UJ
CHRYSENE	NL	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	<5.0 U
DIBENZOFURAN	NL	<5.0 U
DIETHYLPHTHALATE	NL	<5.0 U
DIMETHYL PHTHALATE	NL	<5.0 U
DI-N-BUTYLPHTHALATE	50	<5.0 U
DI-N-OCTYLPHTHALATE	NL	<5.0 U
FLUORANTHENE	NL	<5.0 U
FLUORENE	NL	<5.0 U
HEXACHLOROBENZENE	0.04	***<5.0 U***
HEXACHLOROBUTADIENE	0.5	***<5.0 U***

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ANALYTICAL DATA SUMMARY
RE137 POST-DEVELOPMENT BASELINE MARCH 28, 2017
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE137
Sample Date		3/28/2017
Sample ID		RE137-GW-032817-INF
Sample type code		N
SVOCs 8270D	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	<5.0 U
HEXACHLOROETHANE	5	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	<5.0 U
ISOPHORONE	NL	<5.0 U
NAPHTHALENE	NL	<5.0 U
NITROBENZENE	0.4	***<5.0 U***
N-NITROSODINPROPYLAMINE	NL	<5.0 U
N-NITROSODIPHENYLAMINE	NL	<5.0 U
PENTACHLOROPHENOL	1	***<10.0 UJ***
PHENANTHRENE	NL	<5.0 U
PHENOL	1	***<5.0 U***
PYRENE	NL	<5.0 U

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ANALYTICAL DATA SUMMARY
RE137 POST-DEVEOPMENT BASELINE MARCH 28, 2017
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location				NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE137
Sample Date					3/28/2017
Sample ID					RE137-GW-032817-INF
Sample type code					N
Method	**Analyte**	**Fraction**	**Units**	**(ug/L)**	
2540C	TOTAL DISSOLVED SOLIDS	N	mg/L	500	**55.0**
2540D	TOTAL SUSPENDED SOLIDS	N	mg/L	NL	<10.0 U
350.1	AMMONIA	N	mg/L	2000	<0.10 U
351.2	NITROGEN, TOTAL	N	mg/L	NL	<0.10 U
4500_H+_B	PH	N	PH	NL	**4.4 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	<200 U
6010C	ALUMINUM	N	ug/L	NL	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	***<60.0 U***
6010C	ANTIMONY	N	ug/L	3	***<60.0 U***
6010C	ARSENIC	Dissolved	ug/L	25	<10.0 U
6010C	ARSENIC	N	ug/L	25	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	<200 U
6010C	BARIUM	N	ug/L	1000	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	<5.0 U
6010C	BERYLLIUM	N	ug/L	NL	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	<2.5 U
6010C	CADMIUM	N	ug/L	5	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	**3430**
6010C	CALCIUM	N	ug/L	NL	**3470**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	<10.0 U
6010C	CHROMIUM, TOTAL	N	ug/L	50	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	<50.0 U
6010C	COBALT	N	ug/L	NL	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	<25.0 U
6010C	COPPER	N	ug/L	200	<25.0 U
6010C	IRON	Dissolved	ug/L	300	**171**
6010C	IRON	N	ug/L	300	**311**
6010C	LEAD	Dissolved	ug/L	25	<5.0 U
6010C	LEAD	N	ug/L	25	<5.0 U
6010C	MAGNESIUM	Dissolved	ug/L	NL	**1270**
6010C	MAGNESIUM	N	ug/L	NL	**1320**
6010C	MANGANESE	Dissolved	ug/L	300	**11.0**
6010C	MANGANESE	N	ug/L	300	**11.8**
6010C	NICKEL	Dissolved	ug/L	100	<40.0 U
6010C	NICKEL	N	ug/L	100	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	<5000 U
6010C	POTASSIUM	N	ug/L	NL	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	<10.0 U
6010C	SELENIUM	N	ug/L	10	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	<10.0 U
6010C	SILVER	N	ug/L	50	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	**12600**
6010C	SODIUM	N	ug/L	20000	**12900**
6010C	THALLIUM	Dissolved	ug/L	NL	<10.0 U
6010C	THALLIUM	N	ug/L	NL	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	<50.0 U
6010C	VANADIUM	N	ug/L	NL	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	**44.0**
6010C	ZINC	N	ug/L	NL	**44.4**
7470A	MERCURY	Dissolved	ug/L	0.7	<0.20 U
7470A	MERCURY	N	ug/L	0.7	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	N	mg/L	NL	<2.0 U

Notes:
1. New York State Department of Environmental Conservation Division of Water Technical and Operation Guidance series (6 NYCRR 700-706, Part 703.5 summarized in TOGS 1.1.1). Ambient water quality standards and groundwater effluent limitations, class GA;
NL = Not Listed

Bold = Detected; ***Bold and Italics*** =Not detected exceeds NYS Groundwater Standards or guidance value
Yellow highlighted values exceed Groundwater Standards or guidance value

Sample type codes: N - normal environmental sample, FD - field duplicate

U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

Several volatile organic compound samples were diluted to bracket the concentration of the analyte within the calibration range of the instrument, therefore, raising the reporting limit for that sample.

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/11/2017	4/11/2017
Sample ID			RE137-INF-041117-0830	RE137-EFF-041117-0835	RE137-INF-041117-1400	RE137-EFF-041117-1405
Sample type code			N	N	N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**33.4**	<1.0 U	**24.6 J**	<1.0 UJ
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 UJ
1,1-DICHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<10.0 UJ	<1.0 UJ	<10.0 UJ	<1.0 UJ
2-HEXANONE	50	NL	<10.0 UJ	<1.0 UJ	<10.0 U	<1.0 U
4-METHYL-2-PENTANONE	NL	NL	<10.0 UJ	<1.0 UJ	<10.0 U	<1.0 U
ACETONE	50	NL	<50.0 UJ	<5.0 UJ	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 UJ
BROMOMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 UJ
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 UJ
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 UJ	<1.0 UJ	<10.0 U	<1.0 UJ
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 UJ***	<1.0 UJ
TOLUENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1950**	<1.0 U	**1670**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 UJ***	<1.0 UJ
VINYL CHLORIDE	2	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U	***<20.0 U***	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST

2017 OU2 GROUNDWATER INVESTIGATION

NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041117-2000	RE137-EFF-041117-2005	RE137-INF-041217-0205	RE137-EFF-041217-0210
Sample type code			N	N	N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**25.3 J**	<1.0 UJ	**21.0 J**	<1.0 UJ
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<10.0 UJ	<1.0 UJ	<10.0 UJ	<1.0 UJ
2-HEXANONE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
4-METHYL-2-PENTANONE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
ACETONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
TOLUENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1680**	<1.0 U	**1590**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
VINYL CHLORIDE	2	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U	***<20.0 U***	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST

2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041217-0800	RE137-EFF-041217-0805	RE137-INF-041217-1400	RE137-EFF-041217-1405
Sample type code			N	N	N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**30.6 J**	<1.0 UJ	**29.4 J**	<1.0 UJ
1,1,2-TRICHLOROETHANE	1	5	**1.4**	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	**1.6**	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	**5.8**	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<1.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMOETHANE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<1.0 UJ	<1.0 U	<50.0 U	<5.0 U
2-HEXANONE	50	NL	<1.0 U	<1.0 U	<50.0 U	<5.0 U
4-METHYL-2-PENTANONE	NL	NL	<1.0 U	<1.0 U	<50.0 U	<5.0 U
ACETONE	50	NL	<5.0 U	<5.0 U	<50.0 U	<5.0 U
BENZENE	1	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<1.0 U	<1.0 UJ	<10.0 UJ	<1.0 UJ
BROMOMETHANE	5	NL	<1.0 U	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CARBON DISULFIDE	60	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	**2.5**	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	<1.0 U	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CHLOROFORM	7	NL	**1.8**	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	**4.5**	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<1.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
DICHLORODIFLUOROMETHANE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<1.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	**3.9 J**	<1.0 U	***<10.0 U***	<1.0 U
TOLUENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<1.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1770**	<1.0 U	**1970**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	<1.0 UJ	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
VINYL CHLORIDE	2	NL	<1.0 U	<1.0 U	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	<2.0 U	<2.0 U	***<20.0 U***	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST

2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041217-2000	RE137-EFF-041217-2005	RE137-INF-041317-0205	RE137-EFF-041317-0210
Sample type code			N	N	N	N
VOC 8260C	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**27.3 J**	<1.0 UJ	**27.7 J**	<1.0 UJ
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
2-HEXANONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
4-METHYL-2-PENTANONE	NL	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
ACETONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 UJ	<1.0 UJ	<10.0 UJ	<1.0 UJ
BROMOMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TOLUENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1970**	<1.0 U	**1970**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
VINYL CHLORIDE	2	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U	***<20.0 U***	<2.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041317-0805	RE137-EFF-041317-0810	RE137-INF-041317-1400	RE137-EFF-041317-1405
Sample type code			N	N	N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**32.9 J**	<1.0 UJ	**30.8**	<1.0 U
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	**11.3**	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 U***	<1.0 U	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<50.0 U	<5.0 U	<50.0 UJ	<5.0 UJ
2-HEXANONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
4-METHYL-2-PENTANONE	NL	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
ACETONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 UJ	<1.0 UJ	<10.0 UJ	<1.0 UJ
BROMOMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 UJ***	<1.0 UJ
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TOLUENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1910**	<1.0 U	**1870**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 U***	<1.0 U
VINYL CHLORIDE	2	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U	***<20.0 U***	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST

2017 OU2 GROUNDWATER INVESTIGATION

NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/14/2017	4/14/2017
Sample ID			RE137-INF-041317-2000	RE137-EFF-041317-2005	RE137-INF-041417-0205	RE137-EFF-041417-0210
Sample type code			N	N	N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**29**	<1.0 U	**28**	<1.0 U
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<50.0 UJ	<5.0 UJ	<50.0 UJ	<5.0 UJ
2-HEXANONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
4-METHYL-2-PENTANONE	NL	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
ACETONE	50	NL	<50.0 U	<5.0 U	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 UJ	<1.0 UJ	<10.0 UJ	<1.0 UJ
BROMOMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ	***<10.0 UJ***	<1.0 UJ
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TOLUENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1820**	<1.0 U	**1970**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
VINYL CHLORIDE	2	NL	***<10.0 U***	<1.0 U	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U	***<20.0 U***	<2.0 U

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ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137
Sample Date			4/14/2017	4/14/2017
Sample ID			RE137-INF-041417-0810	RE137-EFF-041417-0815
Sample type code			N	N
VOC 8260C	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1,1-TRICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U
1,1,2,2-TETRACHLOROETHANE	5	NL	***<10.0 U***	<1.0 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	5	**31.3**	<1.0 U
1,1,2-TRICHLOROETHANE	1	5	***<10.0 U***	<1.0 U
1,1-DICHLOROETHANE	5	5	***<10.0 U***	<1.0 U
1,1-DICHLOROETHENE	5	5	***<10.0 U***	<1.0 U
1,2,4-TRICHLOROBENZENE	5	NL	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMO-3-CHLOROPROPANE	0.04	NL	***<10.0 UJ***	<1.0 UJ
1,2-DIBROMOETHANE	NL	NL	<10.0 U	<1.0 U
1,2-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U
1,2-DICHLOROETHANE	5	NL	***<10.0 U***	<1.0 U
1,2-DICHLOROPROPANE	1	NL	***<10.0 U***	<1.0 U
1,3-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U
1,4-DICHLOROBENZENE	3	NL	***<10.0 U***	<1.0 U
2-BUTANONE	50	NL	<50.0 UJ	<5.0 UJ
2-HEXANONE	50	NL	<50.0 U	<5.0 U
4-METHYL-2-PENTANONE	NL	NL	<50.0 U	<5.0 U
ACETONE	50	NL	<50.0 U	<5.0 U
BENZENE	1	NL	***<10.0 U***	<1.0 U
BROMODICHLOROMETHANE	50	NL	<10.0 U	<1.0 U
BROMOFORM	50	NL	<10.0 UJ	<1.0 UJ
BROMOMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ
CARBON DISULFIDE	60	NL	<10.0 U	<1.0 U
CARBON TETRACHLORIDE	5	5	***<10.0 U***	<1.0 U
CHLOROBENZENE	5	NL	***<10.0 U***	<1.0 U
CHLOROETHANE	5	NL	***<10.0 UJ***	<1.0 UJ
CHLOROFORM	7	NL	***<10.0 U***	<1.0 U
CHLOROMETHANE	5	NL	***<10.0 U***	<1.0 U
CIS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U
CIS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U
CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U
DIBROMOCHLOROMETHANE	5	NL	***<10.0 UJ***	<1.0 UJ
DICHLORODIFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U
ETHYLBENZENE	5	NL	***<10.0 U***	<1.0 U
ISOPROPYLBENZENE	5	NL	***<10.0 U***	<1.0 U
M- AND P-XYLENE	NL	NL	<10.0 U	<1.0 U
METHYL ACETATE	NL	NL	<10.0 U	<1.0 U
METHYL CYCLOHEXANE	NL	NL	<10.0 U	<1.0 U
METHYL TERT-BUTYL ETHER	10	NL	<10.0 U	<1.0 U
METHYLENE CHLORIDE	5	NL	***<10.0 U***	<1.0 U
O-XYLENE	NL	NL	<10.0 U	<1.0 U
STYRENE	5	NL	***<10.0 U***	<1.0 U
TETRACHLOROETHENE	5	5	***<10.0 U***	<1.0 U
TOLUENE	5	NL	***<10.0 U***	<1.0 U
TRANS-1,2-DICHLOROETHENE	5	NL	***<10.0 U***	<1.0 U
TRANS-1,3-DICHLOROPROPENE	0.4	NL	***<10.0 U***	<1.0 U
TRICHLOROETHENE	5	5	**1740**	<1.0 U
TRICHLOROFLUOROMETHANE	5	NL	***<10.0 U***	<1.0 U
VINYL CHLORIDE	2	NL	***<10.0 U***	<1.0 U
XYLENES, TOTAL	5	NL	***<20.0 U***	<2.0 U

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ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/11/2017	4/11/2017
Sample ID			RE137-INF-041117-0830	RE137-EFF-041117-0835	RE137-INF-041117-1400	RE137-EFF-041117-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	**12.0**	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

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ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/11/2017	4/11/2017
Sample ID			RE137-INF-041117-0830	RE137-EFF-041117-0835	RE137-INF-041117-1400	RE137-EFF-041117-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 UJ	<10.0 UJ	<10.0 UJ	<10.0 UJ
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041117-2000	RE137-EFF-041117-2005	RE137-INF-041217-0205	RE137-EFF-041217-0210
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/11/2017	4/11/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041117-2000	RE137-EFF-041117-2005	RE137-INF-041217-0205	RE137-EFF-041217-0210
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 UJ	<10.0 UJ	<10.0 UJ	<10.0 UJ
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

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ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041217-0800	RE137-EFF-041217-0805	RE137-INF-041217-1400	RE137-EFF-041217-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 U	<5.0 U
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 UJ	<10.0 UJ
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/12/2017	4/12/2017
Sample ID			RE137-INF-041217-0800	RE137-EFF-041217-0805	RE137-INF-041217-1400	RE137-EFF-041217-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 UJ	<10.0 UJ	<10.0 U	<10.0 U
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041217-2000	RE137-EFF-041217-2005	RE137-INF-041317-0205	RE137-EFF-041317-0210
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 UJ	<10.0 UJ	<10.0 UJ	<10.0 UJ
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

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ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/12/2017	4/12/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041217-2000	RE137-EFF-041217-2005	RE137-INF-041317-0205	RE137-EFF-041317-0210
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041317-0805	RE137-EFF-041317-0810	RE137-INF-041317-1400	RE137-EFF-041317-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 UJ	<10.0 UJ	<10.0 UJ	<10.0 UJ
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/13/2017	4/13/2017
Sample ID			RE137-INF-041317-0805	RE137-EFF-041317-0810	RE137-INF-041317-1400	RE137-EFF-041317-1405
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

E-2
ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/14/2017	4/14/2017
Sample ID			RE137-INF-041317-2000	RE137-EFF-041317-2005	RE137-INF-041417-0205	RE137-EFF-041417-0210
Sample type code			N	N	N	N
SVOCs 8270D	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 UJ	<10.0 UJ	<10.0 UJ	<10.0 UJ
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date			4/13/2017	4/13/2017	4/14/2017	4/14/2017
Sample ID			RE137-INF-041317-2000	RE137-EFF-041317-2005	RE137-INF-041417-0205	RE137-EFF-041417-0210
Sample type code			N	N	N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137
Sample Date			4/14/2017	4/14/2017
Sample ID			RE137-INF-041417-0810	RE137-EFF-041417-0815
Sample type code			N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
1,1-BIPHENYL	5	NL	<5.0 U	<5.0 U
2,2'-OXYBIS(1-CHLOROPROPANE)	5	NL	<5.0 U	<5.0 U
2,4,5-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U
2,4,6-TRICHLOROPHENOL	NL	NL	<5.0 U	<5.0 U
2,4-DICHLOROPHENOL	1	NL	<5.0 U	<5.0 U
2,4-DIMETHYLPHENOL	1	NL	<5.0 U	<5.0 U
2,4-DINITROPHENOL	1	NL	<10.0 U	<10.0 U
2,4-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U
2,6-DINITROTOLUENE	5	NL	<5.0 U	<5.0 U
2-CHLORONAPHTHALENE	NL	NL	<5.0 U	<5.0 U
2-CHLOROPHENOL	NL	NL	<5.0 U	<5.0 U
2-METHYLNAPHTHALENE	NL	NL	<5.0 U	<5.0 U
2-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U
2-NITROANILINE	5	NL	<5.0 U	<5.0 U
2-NITROPHENOL	NL	NL	<5.0 U	<5.0 U
3- AND 4-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U
3,3-DICHLOROBENZIDINE	5	NL	<5.0 U	<5.0 U
3-NITROANILINE	5	NL	<5.0 U	<5.0 U
4,6-DINITRO-2-METHYLPHENOL	NL	NL	<10.0 U	<10.0 U
4-BROMOPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U
4-CHLORO-3-METHYLPHENOL	NL	NL	<5.0 U	<5.0 U
4-CHLOROANILINE	5	NL	<5.0 U	<5.0 U
4-CHLOROPHENYL-PHENYLETHER	NL	NL	<5.0 U	<5.0 U
4-NITROANILINE	5	NL	<5.0 U	<5.0 U
4-NITROPHENOL	NL	NL	<10.0 UJ	<10.0 UJ
ACENAPHTHENE	NL	NL	<5.0 U	<5.0 U
ACENAPHTHYLENE	NL	NL	<5.0 U	<5.0 U
ACETOPHENONE	NL	NL	<5.0 U	<5.0 U
ANTHRACENE	NL	NL	<5.0 U	<5.0 U
ATRAZINE	7.5	NL	<5.0 U	<5.0 U
BENZALDEHYDE	NL	NL	<5.0 U	<5.0 U
BENZO[A]ANTHRACENE	NL	NL	<5.0 U	<5.0 U
BENZO[A]PYRENE	NL	NL	<5.0 U	<5.0 U
BENZO[B]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U
BENZO[G,H,I]PERYLENE	NL	NL	<5.0 U	<5.0 U
BENZO[K]FLUORANTHENE	NL	NL	<5.0 U	<5.0 U
BIS(2-CHLOROETHOXY)METHANE	5	NL	<5.0 U	<5.0 U
BIS(2-CHLOROETHYL)ETHER	1	NL	<5.0 U	<5.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	5	NL	<5.0 U	<5.0 U
BUTYLBENZYLPHTHALATE	NL	NL	<5.0 U	<5.0 U
CAPROLACTAM	NL	NL	<5.0 U	<5.0 U
CARBAZOLE	NL	NL	<5.0 U	<5.0 U
CHRYSENE	NL	NL	<5.0 U	<5.0 U
DIBENZ[A,H]ANTHRACENE	NL	NL	<5.0 U	<5.0 U
DIBENZOFURAN	NL	NL	<5.0 U	<5.0 U
DIETHYLPHTHALATE	NL	NL	<5.0 U	<5.0 U
DIMETHYL PHTHALATE	NL	NL	<5.0 U	<5.0 U
DI-N-BUTYLPHTHALATE	50	NL	<5.0 U	<5.0 U
DI-N-OCTYLPHTHALATE	NL	NL	<5.0 U	<5.0 U
FLUORANTHENE	NL	NL	<5.0 U	<5.0 U
FLUORENE	NL	NL	<5.0 U	<5.0 U
HEXACHLOROBENZENE	0.04	NL	<5.0 U	<5.0 U
HEXACHLOROBUTADIENE	0.5	NL	<5.0 U	<5.0 U

E-2
ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137
Sample Date			4/14/2017	4/14/2017
Sample ID			RE137-INF-041417-0810	RE137-EFF-041417-0815
Sample type code			N	N
SVOCs 8270D	**(ug/L)**	**(ug/L)**	**(ug/L)**	**(ug/L)**
HEXACHLOROCYCLOPENTADIENE	5	NL	<5.0 UJ	<5.0 UJ
HEXACHLOROETHANE	5	NL	<5.0 U	<5.0 U
INDENO[1,2,3-CD]PYRENE	NL	NL	<5.0 U	<5.0 U
ISOPHORONE	NL	NL	<5.0 U	<5.0 U
NAPHTHALENE	NL	NL	<5.0 U	<5.0 U
NITROBENZENE	0.4	NL	<5.0 U	<5.0 U
N-NITROSODINPROPYLAMINE	NL	NL	<5.0 U	<5.0 U
N-NITROSODIPHENYLAMINE	NL	NL	<5.0 U	<5.0 U
PENTACHLOROPHENOL	1	NL	<10.0 U	<10.0 U
PHENANTHRENE	NL	NL	<5.0 U	<5.0 U
PHENOL	1	NL	<5.0 U	<5.0 U
PYRENE	NL	NL	<5.0 U	<5.0 U

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/11/2017	4/11/2017	4/11/2017	4/11/2017
Sample ID						RE137-INF-041117-0830	RE137-EFF-041117-0835	RE137-INF-041117-1400	RE137-EFF-041117-1405
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**60.0**	**49.0**	**79.0**	**66.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<10.0 U	<10.0 U	<4.0 U	<2.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	**0.13**	<0.10 U	<0.10 U	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.1 J**	**6.1 J**	**4.3 J**	**5.0 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3200**	**5190**	**3270**	**4250**
6010C	CALCIUM	Total	ug/L	NL	NL	**3330**	**6610**	**3250**	**4300**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	<25.0 U	**38.4**	<25.0 U	**160**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**57.9**	<25.0 U	**181**
6010C	IRON	Dissolved	ug/L	300	Monitor	**189**	<100 U	**192**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**257**	**327**	**241**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	**7.7**	<5.0 U	<5.0 U
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	**34.9**	<5.0 U	<5.0 U
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1240**	**1260**	**1230**	**1280**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1250**	**1310**	**1300**	**1320**
6010C	MANGANESE	Dissolved	ug/L	300	NL	**19.0**	**149**	<10.0 U	**72.7**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**199**	<10.0 U	**72.3**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**11400**	**11700**	**10800**	**10700**
6010C	SODIUM	Total	ug/L	20000	NL	**12100**	**12500**	**11100**	**11300**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**99.8**	**182**	**171**	**143**
6010C	ZINC	Total	ug/L	NL	NL	**60.7**	**135**	**37.2**	**69.4**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST

2017 OU2 GROUNDWATER INVESTIGATION

NWIRP BETHPAGE, NY

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/11/2017	4/11/2017	4/12/2017	4/12/2017
Sample ID						RE137-INF-041117-2000	RE137-EFF-041117-2005	RE137-INF-041217-0205	RE137-EFF-041217-0210
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**58.0**	**58.0**	**61.0**	**73.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	<0.10 U	<0.10 U	**0.11**	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.1 J**	**4.7 J**	**4.0 J**	**4.4 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3240**	**4030**	**3290**	**3860**
6010C	CALCIUM	Total	ug/L	NL	NL	**3310**	**4100**	**3140**	**3800**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	<25.0 U	**172**	<25.0 U	**156**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**186**	<25.0 U	**168**
6010C	IRON	Dissolved	ug/L	300	Monitor	**191**	<100 U	**185**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**225**	<100 U	**214**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1280**	**1280**	**1270**	**1270**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1340**	**1320**	**1260**	**1290**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**52.0**	<10.0 U	**39.3**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**51.1**	<10.0 U	**37.2**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10600**	**10500**	**10500**	**10400**
6010C	SODIUM	Total	ug/L	20000	NL	**11300**	**11300**	**10700**	**10800**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**62.1**	**66.3**	**44.4**	**53.2**
6010C	ZINC	Total	ug/L	NL	NL	**36.1**	**64.5**	**31.1**	**45.0**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/12/2017	4/12/2017	4/12/2017	4/12/2017
Sample ID						RE137-INF-041217-0800	RE137-EFF-041217-0805	RE137-INF-041217-1400	RE137-EFF-041217-1405
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**55.0**	**55.0**	**67.0**	**63.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<4.0 U	<4.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	<0.10 U	<0.10 U	**0.18**	**0.23**
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.3 J**	**4.4 J**	**4.4 J**	**4.6 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3260**	**3730**	**3310**	**3720**
6010C	CALCIUM	Total	ug/L	NL	NL	**3160**	**3740**	**3190**	**3560**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	<25.0 U	**154**	**42.4**	**161**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**160**	<25.0 U	**155**
6010C	IRON	Dissolved	ug/L	300	Monitor	**176**	<100 U	**152**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**209**	<100 U	**201**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	**6.2**	<5.0 U	<5.0 U
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	**5.2**	<5.0 U	**7.5**
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1280**	**1280**	**1250**	**1290**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1310**	**1270**	**1260**	**1280**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**32.9**	<10.0 U	**28.5**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**31.7**	<10.0 U	**26.6**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10600**	**10400**	**10400**	**10400**
6010C	SODIUM	Total	ug/L	20000	NL	**10700**	**11100**	**11000**	**10900**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**80.8**	**126**	**222**	**60.0**
6010C	ZINC	Total	ug/L	NL	NL	**42.4**	**54.8**	**33.4**	**63.2**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U

E-2
ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/12/2017	4/12/2017	4/13/2017	4/13/2017
Sample ID						RE137-INF-041217-2000	RE137-EFF-041217-2005	RE137-INF-041317-0205	RE137-EFF-041317-0210
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**52.0**	**72.0**	**69.0**	**72.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<4.0 U	<4.0 U	<4.0 U	<4.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	**0.13**	**0.11**	<0.10 U	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.3 J**	**4.5 J**	**4.1 J**	**4.3 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	**942**
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3330**	**3680**	**3300**	**3660**
6010C	CALCIUM	Total	ug/L	NL	NL	**3200**	**3570**	**3170**	**3440**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	**28.0**	**142**	<25.0 U	**124**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**136**	<25.0 U	**113**
6010C	IRON	Dissolved	ug/L	300	Monitor	**163**	<100 U	**166**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**190**	<100 U	**179**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	**5.4**
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1290**	**1280**	**1280**	**1280**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1310**	**1290**	**1290**	**1290**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**25.8**	<10.0 U	**22.8**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**24.4**	<10.0 U	**20.7**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10400**	**10400**	**10400**	**10400**
6010C	SODIUM	Total	ug/L	20000	NL	**11200**	**11200**	**11200**	**11000**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**37.8**	**53.9**	**36.0**	**52.0**
6010C	ZINC	Total	ug/L	NL	NL	**44.3**	**58.7**	**39.3**	**47.9**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/13/2017	4/13/2017	4/13/2017	4/13/2017
Sample ID						RE137-INF-041317-0805	RE137-EFF-041317-0810	RE137-INF-041317-1400	RE137-EFF-041317-1405
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**74.0**	**72.0**	**27.0**	**35.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<4.0 U	<4.0 U	<4.0 U	<4.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.1 J**	**4.3 J**	**4.2 J**	**4.3 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3260**	**3620**	**3190**	**3330**
6010C	CALCIUM	Total	ug/L	NL	NL	**3040**	**3340**	**3140**	**3480**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	<25.0 U	**117**	<25.0 U	**101**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**105**	<25.0 U	**113**
6010C	IRON	Dissolved	ug/L	300	Monitor	**152**	<100 U	**133**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**168**	<100 U	**175**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	**7.7**
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	**13.7**
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1280**	**1270**	**1240**	**1230**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1220**	**1240**	**1250**	**1320**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**20.9**	<10.0 U	**18.2**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**18.3**	<10.0 U	**18.7**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10300**	**10300**	**10400**	**10500**
6010C	SODIUM	Total	ug/L	20000	NL	**10800**	**10900**	**10800**	**11000**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**35.0**	**47.1**	**51.5**	**71.0**
6010C	ZINC	Total	ug/L	NL	NL	**32.9**	**46.2**	**39.1**	**67.6**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	**8.0**	<2.0 U	<2.0 U	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137	RE137	RE137
Sample Date						4/13/2017	4/13/2017	4/14/2017	4/14/2017
Sample ID						RE137-INF-041317-2000	RE137-EFF-041317-2005	RE137-INF-041417-0205	RE137-EFF-041417-0210
Sample type code						N	N	N	N
Method	**Analyte**	**Fraction**	**Units**						
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**34.0**	**40.0**	**39.0**	**40.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<4.0 U	<4.0 U	<4.0 U	<4.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.1 J**	**4.2 J**	**4.0 J**	**4.2 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3050**	**3300**	**3090**	**3180**
6010C	CALCIUM	Total	ug/L	NL	NL	**3210**	**3400**	**3200**	**3300**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	<25.0 U	**91.5**	<25.0 U	**91.1**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**96.4**	<25.0 U	**95.2**
6010C	IRON	Dissolved	ug/L	300	Monitor	**136**	<100 U	**126**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**170**	<100 U	**172**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	**7.2**
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	<5.0 U	<5.0 U	**6.6**
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1280**	**1250**	**1200**	**1190**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1290**	**1270**	**1320**	**1260**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**16.6**	<10.0 U	**15.2**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**16.8**	<10.0 U	**15.2**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10300**	**10400**	**10400**	**10000**
6010C	SODIUM	Total	ug/L	20000	NL	**10900**	**10800**	**10800**	**10600**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**50.6**	**59.2**	**51.8**	**61.8**
6010C	ZINC	Total	ug/L	NL	NL	**33.2**	**56.7**	**40.6**	**52.3**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U	<2.0 U	<2.0 U

Location				NYSDEC Groundwater Guidance or Standard Value **[applies to INF]** (Note 1)	Daily Maximum Discharge Limits for Groundwater Extraction & Treatment System **[applies to EFF]** (Note 2)	RE137	RE137
Sample Date						4/14/2017	4/14/2017
Sample ID						RE137-INF-041417-0810	RE137-EFF-041417-0815
Sample type code						N	N
Method	**Analyte**	**Fraction**	**Units**				
2540C	TOTAL DISSOLVED SOLIDS	Total	mg/L	500	NL	**29.0**	**47.0**
2540D	TOTAL SUSPENDED SOLIDS	Total	mg/L	NL	NL	<4.0 U	<4.0 U
350.1	AMMONIA	Total	mg/L	2000	NL	<0.10 U	<0.10 U
351.2	NITROGEN, TOTAL	Total	mg/L	NL	NL	<0.10 U	<0.10 U
4500_H+_B	PH	Total	PH	NL	6.0 - 9.0	**4.0 J**	**4.2 J**
6010C	ALUMINUM	Dissolved	ug/L	NL	NL	<200 U	<200 U
6010C	ALUMINUM	Total	ug/L	NL	NL	<200 U	<200 U
6010C	ANTIMONY	Dissolved	ug/L	3	NL	<60.0 U	<60.0 U
6010C	ANTIMONY	Total	ug/L	3	NL	<60.0 U	<60.0 U
6010C	ARSENIC	Dissolved	ug/L	25	NL	<10.0 U	<10.0 U
6010C	ARSENIC	Total	ug/L	25	NL	<10.0 U	<10.0 U
6010C	BARIUM	Dissolved	ug/L	1000	NL	<200 U	<200 U
6010C	BARIUM	Total	ug/L	1000	NL	<200 U	<200 U
6010C	BERYLLIUM	Dissolved	ug/L	NL	NL	<5.0 U	<5.0 U
6010C	BERYLLIUM	Total	ug/L	NL	NL	<5.0 U	<5.0 U
6010C	CADMIUM	Dissolved	ug/L	5	NL	<2.5 U	<2.5 U
6010C	CADMIUM	Total	ug/L	5	NL	<2.5 U	<2.5 U
6010C	CALCIUM	Dissolved	ug/L	NL	NL	**3060**	**3270**
6010C	CALCIUM	Total	ug/L	NL	NL	**3270**	**3370**
6010C	CHROMIUM, TOTAL	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U
6010C	CHROMIUM, TOTAL	Total	ug/L	50	NL	<10.0 U	<10.0 U
6010C	COBALT	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U
6010C	COBALT	Total	ug/L	NL	NL	<50.0 U	<50.0 U
6010C	COPPER	Dissolved	ug/L	200	NL	**67.4**	**83.4**
6010C	COPPER	Total	ug/L	200	NL	<25.0 U	**117**
6010C	IRON	Dissolved	ug/L	300	Monitor	**131**	<100 U
6010C	IRON	Total	ug/L	300	Monitor	**161**	<100 U
6010C	LEAD	Dissolved	ug/L	25	NL	<5.0 U	**5.1**
6010C	LEAD	Total	ug/L	25	NL	<5.0 U	**5.8**
6010C	MAGNESIUM	Dissolved	ug/L	NL	NL	**1230**	**1200**
6010C	MAGNESIUM	Total	ug/L	NL	NL	**1280**	**1300**
6010C	MANGANESE	Dissolved	ug/L	300	NL	<10.0 U	**15.7**
6010C	MANGANESE	Total	ug/L	300	NL	<10.0 U	**15.1**
6010C	NICKEL	Dissolved	ug/L	100	NL	<40.0 U	<40.0 U
6010C	NICKEL	Total	ug/L	100	NL	<40.0 U	<40.0 U
6010C	POTASSIUM	Dissolved	ug/L	NL	NL	<5000 U	<5000 U
6010C	POTASSIUM	Total	ug/L	NL	NL	<5000 U	<5000 U
6010C	SELENIUM	Dissolved	ug/L	10	NL	<10.0 U	<10.0 U
6010C	SELENIUM	Total	ug/L	10	NL	<10.0 U	<10.0 U
6010C	SILVER	Dissolved	ug/L	50	NL	<10.0 U	<10.0 U
6010C	SILVER	Total	ug/L	50	NL	<10.0 U	<10.0 U
6010C	SODIUM	Dissolved	ug/L	20000	NL	**10200**	**10400**
6010C	SODIUM	Total	ug/L	20000	NL	**11200**	**10800**
6010C	THALLIUM	Dissolved	ug/L	NL	NL	<10.0 U	<10.0 U
6010C	THALLIUM	Total	ug/L	NL	NL	<10.0 U	<10.0 U
6010C	VANADIUM	Dissolved	ug/L	NL	NL	<50.0 U	<50.0 U
6010C	VANADIUM	Total	ug/L	NL	NL	<50.0 U	<50.0 U
6010C	ZINC	Dissolved	ug/L	NL	NL	**105**	**68.6**
6010C	ZINC	Total	ug/L	NL	NL	**43.0**	**51.0**
7470A	MERCURY	Dissolved	ug/L	0.7	NL	<0.20 U	<0.20 U
7470A	MERCURY	Total	ug/L	0.7	NL	<0.20 U	<0.20 U
SM5210B	BIOCHEMICAL OXYGEN DEMAND	Total	mg/L	NL	NL	<2.0 U	<2.0 U

ANALYTICAL DATA DURING RE137 CONSTANT RATE TEST
2017 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Notes:

1. New York State Department of Environmental Conservation Division of Water Technical and Operation Guidance series (6 NYCRR 700-706, Part 703.5 summarized in TOGS 1.1.1). Ambient water quality standards and groundwater effluent limitations, class GA; NL = Not Listed

2. Discharge Limits for NGC-USNAVY OU2 RE-108 Hotspot Area Groundwater Extraction & Treatment System per New York State Department of Environmental Conservation Division of Water (DER Site ID 1-30-003B, issued February 15, 2017). NL = Not Listed

Bold = Detected; ***Bold and Italics*** =Not detected exceeds NYS Groundwater Standards or guidance value
Yellow highlighted values exceed Groundwater Standards or guidance value

Sample type codes: N - normal environmental sample, FD - field duplicate

U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

Several volatile organic compound samples were diluted to bracket the concentration of the analyte within the calibration range of the instrument, therefore, raising the reporting limit for that sample.

NEW YORK PROFESSIONAL GEOLOGIST SEAL

As a New York-licensed Professional Geologist, I have reviewed and approve this Capture Zone Report for Groundwater at Naval Industrial Reserve Plant Bethpage Operable Unit 2, Site 1, and seal it in accordance with Article 145 Section 7209 of the New York State Education Laws. In sealing this document, I certify it was prepared under my direction, the geological information contained in it is true to the best of my knowledge and the geological methods and procedures included herein are consistent with currently accepted geological practices.

It is a violation of this law for any person to alter the contained geological drawings or the geological report in any way, unless he or she is acting under the direction of a NY-licensed Professional Geologist.

Name:	Brian E. Caldwell
NY PG License Number:	000511
State:	New York

STATE OF NEW YORK
BRIAN E. CALDWELL
511
LICENSED PROFESSIONAL GEOLOGIST

Signature:

Date: